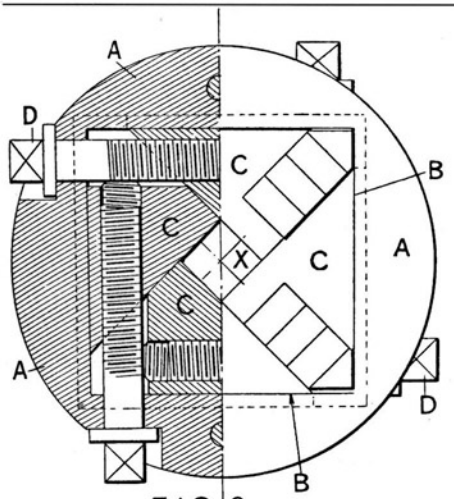

FIG. 3

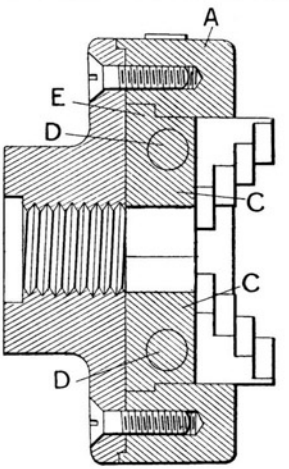

FIG. 4.

CHUCKS
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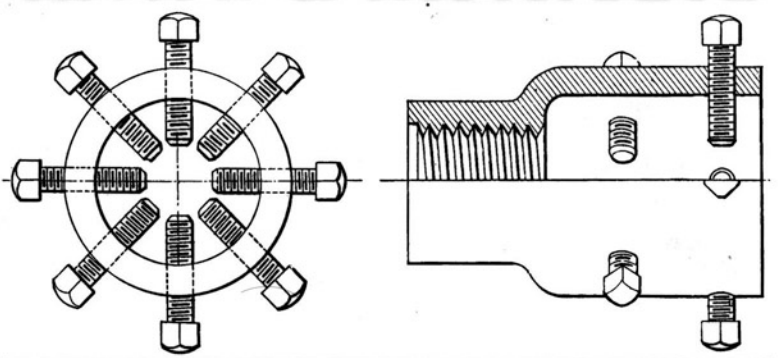

Machinery's Industrial Secrets

Selected articles from early issues of Machinery Magazine revealing secrets of manufacturing.

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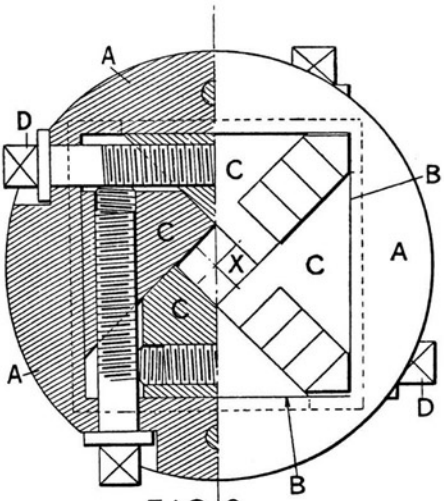

FIG. 3

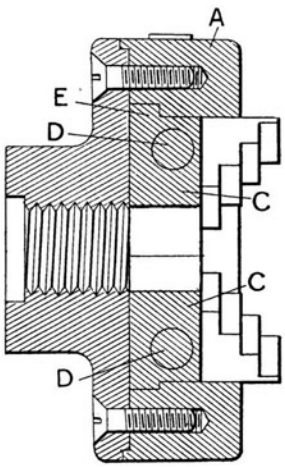

FIG. 4.

Self-Centring Chucks

Abstracts of Patent Specifications

MACHINERY MAGAZINE - JULY 31, 1913

According to this invention, self-centring chucks and toolholders consist of a number of similarly shaped triangular members associated together so that their apices meet at the centre (or would so meet if not modified in shape), means being provided to cause the members to slide upon each other to vary the aperture. In the form shown in Figs. 3 and 4, the jaws *C* are in the form of isosceles triangles, and are fitted in a square recess *B*, screws *D*, or equivalent means, being provided to vary the aperture *X*. The body *A* is made in two parts to facilitate assemblage of the jaws, which are provided with enlarged bases *E*, sliding in corresponding guiding recesses in the body. In the form shown in Figs. 5 and 6, three jaws in the form of isosceles triangles *C* are provided; they project through gaps F^1 in the

Machinery's **INDUSTRIAL SECRETS**

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Chucks - Review & Restoration

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1999 - ISBN 1-55918-231-8 9 8 7 6 5 4 3 2 1

sides of the casing *A*, and are preferably rounded off at the outer corners. A front plate *H* keeps the jaws in place, and only one adjusting screw *D* is provided for varying the triangular aperture *X*. In the form shown in Figs. 7 and 8, the jaws *C* are in the form of scalene triangles, and the sides of the polygonal recess *B* are inclined as shown. The jaws are actuated by a shank *I* having an enlarged part *J* screwing with the rear of the casing *A* and to give them their correct relative movement while opening obliquely, grooves M are provided, in which lugs or extensions *O* on the sides of the jaws are adapted to slide.

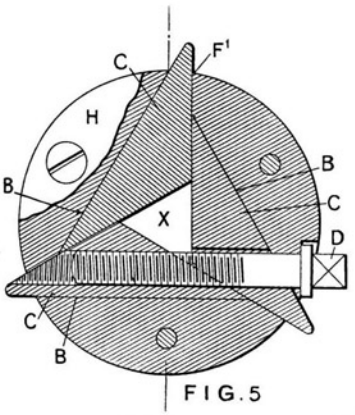


FIG. 5

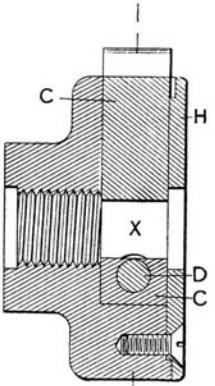


FIG. 6.

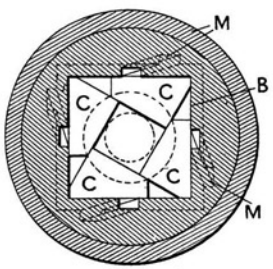


FIG. 8.

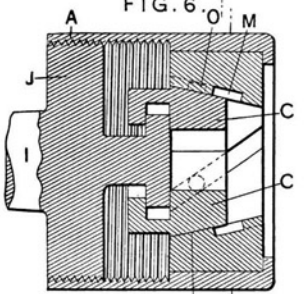


FIG. 7.

– (R. DARKIN, Seafield Park College, Fareham, Hants. No. 12465, 1912.)

Truing Up Chuck Jaws

Letters on Practical Subjects

MACHINERY MAGAZINE – AUGUST 12, 1915

It is hard to see why anyone should attempt to true up the inside gripping faces of chuck jaws with the jaws straining out against a ring, as shown at *A* in Fig. 1, but this is done by many men who consider themselves good mechanics. If the ring were placed as shown at *B*, the conditions would not be so bad; but in order to obtain the most favourable results, the ring should be placed as shown at *C* in Fig. 2, as this places the jaws under the same conditions which exist while they are holding a piece of work. The illustration shows the nature of the

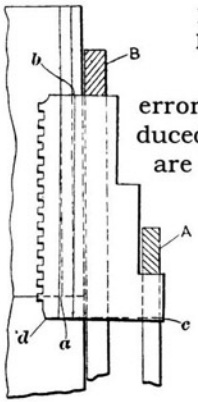


Fig. 1. Incorrect Method of using Setting Ring

error that is introduced when the jaws are trued up with the ring applied as shown at *A* and *B*. With the ring in position *A*, the straining out of the jaws sets them at an angle with the body of the chuck, indicated by *a* and *b*. It makes no difference how new and close fitting the jaws of the chuck may be; there is bound to be a certain amount of error of this nature. And even if we could imagine a chuck with absolutely no play in the bearing surfaces of the jaws, there would still be

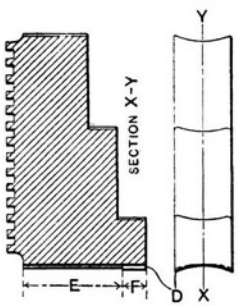


Fig. 3. Error produced by not using a Shim in re-setting

a tendency for the chuck body to spring. Boring the jaws while in this position results in cutting away more metal at *c* than at *d*, the cut being indicated by the dotted line. When gripping the work with a surface finished in this way, the pressure of the jaws is reversed and a bell-mouthed opening is produced that is shown by the full line in Fig. 2. With the ring set at *B* the tendency to strain the jaws and chuck body out of true is not so great, but there is still likelihood of trouble from this source.

When using a ring in the position shown at *C* in Fig. 2, the jaws are strained open at the outside, and a parallel cut taken

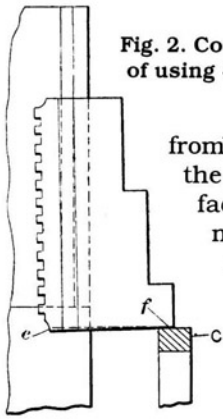


Fig. 2. Correct Method of using Setting Ring

from the inside of the gripping surface cuts away more metal at *e* than at *f*. The jaws should be carefully centred with the chuck body and a cut started at *e* that will almost reach the surface when the left-hand side of the ring *C* is reached. The ring is then placed farther in to allow the cut to be completed; and in making this second setting of the ring it should not be placed any farther back than necessary. The ring will have to be increased in size by the use of suitable shims in order to compensate for the metal which has been removed from the chuck jaw by the partially completed cut. If this is not done, the condition shown at *D* in Fig. 3 will result. The surface *E*, which has been bored on a larger radius, will be flatter than the surface *F*. This error will, however, be negligible in most cases.

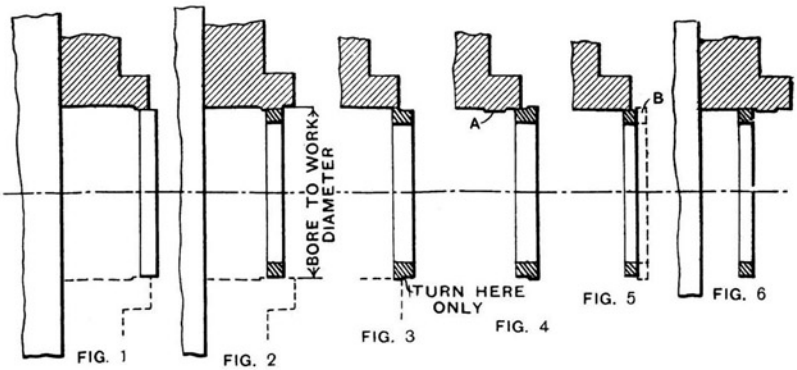
W.S.R.

Truing Up Chuck Jaws

Letters On Practical Subjects

MACHINERY MAGAZINE – SEPTEMBER 30, 1915

The difficulties experienced in chucking work true for second operations have often led to the entire or partial abandonment of what are termed chucking methods. Manufacturers of chucking lathes, it seems to me, would do well to furnish with machines full instructions for procedure. None, to my knowledge, as yet do this. The article by "W.S.R." at page 649, August 12 issue, suggests some of the difficulties and seeks to mitigate them. The methods there detailed can, however, to advantage, be supplemented.



Most self-centring chucks have three jaws. To turn out these jaws to fit the work behind a ring gripped as shown by your contributor, and by myself at Fig. 1, is a by no means simple matter. The jaws when turned should fit the work precisely, for if they do not, then the same portion of the scroll which was in use when gripping the ring will not be in use when gripping the work, an important desideratum, as those know who have noted the uneven wear to which scroll threads are subject: (To the Taylor "spiral" chuck and the Coventry concentric chuck these dicta do not apply so forcibly, for in the former the scroll is hardened and ground, and in the latter the surfaces in contact are unusually large.) Any suggestion to the end of mitigating this difficulty, then, merits consideration. There are several possible methods.

If it is necessary to bore the jaws to a slight depth only, then the obvious method is to close the jaws on to a ring set sufficiently far back to allow the jaws to be bored out the necessary depth. But at times the jaws must be bored right through or at least to the level of the chuck body. Then, if we insert the ring

at the extreme tips of the jaws measuring difficulties eventuate, as I have pointed out. But the ring can be set slightly inside the jaws as is shown in Fig. 2, so enabling the front ends to be bored to the work using it as a gauge. Then, in boring behind the ring, the already bored tips can be used as setting points for the tool prior to taking a finishing cut behind the ring. A stop or indicator to relocate the tool, after it is drawn back to allow it to pass the ring, is, of course, necessary. The same ring, shimmed up, can be employed to hold back the jaws whilst turning out the portions which held the ring. But a far preferable method is to use another ring having its diameter precisely that of the work. Black rings should be kept in stock varying in small steps in their diameter. These could be turned in another lathe or the chucking machine operator would make this his first concern in starting on a new job.

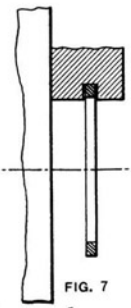


FIG. 7

The rings could be prepared in two different ways. A ring could be chucked in the soft jaws which are eventually to hold the blanks to be turned, and turned to the shape shown in Fig. 3, then used as is shown in Fig. 4, whilst the portion *A* is being reduced to the already turned level. Or the flange *B* could be removed at a second chucking as indicated in Fig. 5, and the ring used as shown in Fig. 6. Which of these two methods would be preferable depends on the overall depth of the jaws, the former in the case of shallow jaws, the latter for deep jaws.

One good method in somewhat extensive use is that depicted in Fig. 7. A ring is prepared of thin, but rather deep, section for insertion in a groove centrally turned in the jaws. Where the jaws need only be opened out at the ends a "spider" with adjustable legs is sometimes employed. (See Fig. 8). And Fig. 9 illustrates a method employed in at least one shop I know. *C* is a ring surrounding the chuck body. The set-screws enable the jaws to be pulled back approximately as they would be pushed by the work.

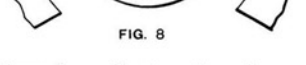


FIG. 8

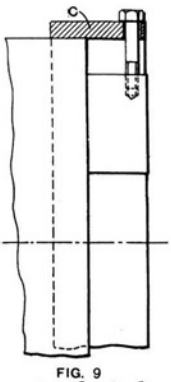


FIG. 9

For preparing the jaws for gripping internally similar methods are available, but in this case the jaws are expanded into a ring.

F.W.S.

Truing Up Chuck Jaws

Letters on Practical Subjects

MAGAZINERY MAGAZINE – OCTOBER 21, 1915

Not wishing to criticise "W.S.R.'s" method of procedure in the truing up of chuck jaws on page 649 of the August 12 issue, which he admits contains a negligible quantity, could not the ring be used as sectioned in Fig. 1, which he condemns, and the jaws be bored taper slightly larger towards the rear end, with the compound rest or taper attachment to compensate the play or spring in the chuck slots? May I suggest what I think would be a more satisfactory way of accomplishing the job? Why not drill and tap a hole and insert a set screw in each jaw in the position shown in Fig. 2, the size of the hole to be governed by the size of the jaw, and a ring used as shown in position? By this method a parallel cut could be taken the full length of the jaws.

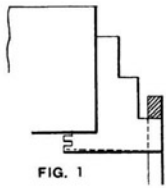


FIG. 1

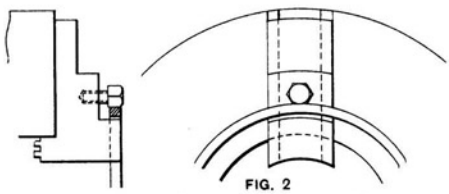


FIG. 2

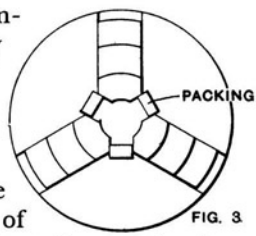


FIG. 3

Another method which I have repeatedly used in the case of hardened jaws, with excellent results, is to place packings of equal thickness between the jaws in the position shown in Fig. 3, and grind the jaws with an electric centre grinder. I designed a spindle to go up the inside of the jaws out of a half-inch bright bolt which I mounted on the end of the grinder spindle in place of the nut, as in Fig. 4. It is advisable not to use a bolt longer than is absolutely necessary. For safety's sake, it is better to remove the centre grinding wheel, and replace it with a distance collar of equal width, but this is not absolutely necessary. Great care must 'be taken to get the screwed hole in the head of the bolt perfectly true. I might add, in the case of universal chucks, my impression is, that if the scroll of the chuck has worn uneven, no amount of boring or grinding will make a satisfactory job until a new one has been inserted, as it is only correct at the size it was positioned at when rectified.

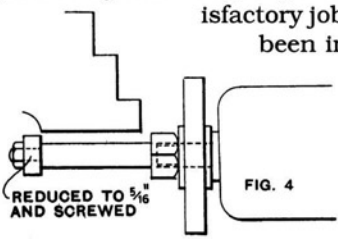


FIG. 4

Tinsley
W.E.P.

Two New Methods Of Truing Chuck Jaws

Letters on Practical Subjects

MACHINERY MAGAZINE – NOVEMBER 18, 1915

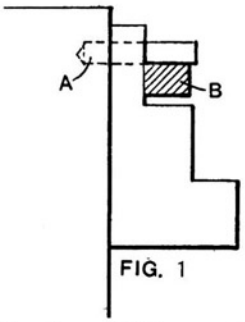


FIG. 1

One difficulty in truing the jaws of a self-centring chuck is to get a straight through cut along the jaws. This may be overcome by the following method, which is very simple and quick. The jaws are drilled as at *A*, Fig. 1, and a temporary steel plug is fitted. The ring *B* is next clamped between the plugs, and the work of turning the jaws is then a matter of only a few minutes.

Another way to true the jaws, but not nearly so good as the previous method is to place a reamer between the centres as at Fig. 2, and to pull the lathe round by hand, at the same time closing the jaws until they are true. The reamer should be the same size as the job to be gripped. This method will do for sizes below an inch, where there is a difficulty of boring with an inside turning to .01.

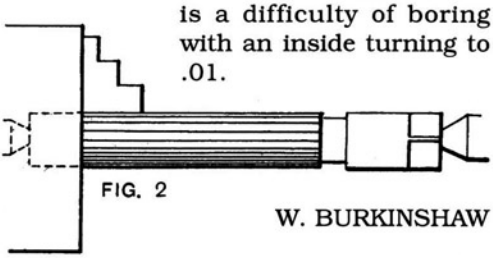


FIG. 2

W. BURKINSHAW

Lathe Chucks – I

A Review of Faceplate and Collet Work-Holders

BY JOSEPH HORNER, A.M.I. MECH. E.

MACHINERY MAGAZINE – APRIL 6, 1916

The potter's wheel is obviously the clue to the origin of lathe chucks, and its simple form is still representative of the great group of face chucks. The only essential difference is that in the latter a precise means of obtaining a frictional hold upon the work is provided in the form of jaws or other devices, necessitated by the nature of turning. The fact that a large proportion of turned work has to be steadied or supported upon an extraneous centre does not alter the principle, since the chuck is always the driving agent. The earliest types of lathes comprised nothing more than a couple of centres held in uprights driven in the ground, and the work was rotated with a cord. At this time no kind of chuck was used, but the abandonment of the cord drive brought about the necessity for a driver or chuck, and

upon the advent of the hand-wheel, foot-wheel, and power agency for driving the lathe regular chucks were developed. At the present day it is bewildering to attempt to grasp the immense variety of chucks in use. Even during the last five years or so their ranks have received great accretions on account of the increasing practice of using special chucks for gripping repetition work, particularly in automobile manufacture. In addition to specialized shapes of jaws, the chucks often include seatings or abutments for the purpose of support or precise location of the object, and holes for the reception of pilots on tools.

Apart from this growing specialization in chuck design, the chief point which differentiates modern types from those of, say, a decade since is that of enhanced strength. In the majority of cases standard designs have been made heavier. In other cases new designs have been evolved to meet the greater strains produced in dealing with high-speed work. Chucks with steel instead of cast-iron bodies are now largely used. The use of auxiliary screw dogs or serrated jaws is noticeable in many instances as a help to the frictional drive of the standard jaws. There is difficulty in dealing with classes of work which are liable to distortion through pressure wrongly applied. In such cases it may be impracticable to exercise any great force in clamping, because the work will assume a distorted form, and will spring back to its original outline upon being released from the chuck. This, of course, would give detrimental and uncertain results. The employment of driving pins or flanges solves the difficulty in some shapes, these drivers rotating the piece against the stress of cutting. When it is not feasible to introduce driving pins or flanges a considerable amount of thought and care may have to be exercised in designing the chuck or its jaws. Sometimes even the selection of a safe mode of chucking alters the determination of the precise type of machine which the piece shall be machined upon.

Another question that must never be disregarded is whether the work will run in proper balance, and for this reason a good many objects are tooled while held in a fixed position in preference to rotating them in a lathe. If work is repetitive the expense and time occupied in securing a proper balance by the use of a counterweight on the chuck is repaid, and if there are a number of operations that follow in succession and can be best done with tools from a turret, it is better to revolve the work and machine it in this fashion. A piece might be more easily gripped on a boring type of machine without the need of balancing, since the piece remains stationary, but the time of changing tools in the boring spindle would make this method prohibitive.

The question of the relative number of parts to be machined

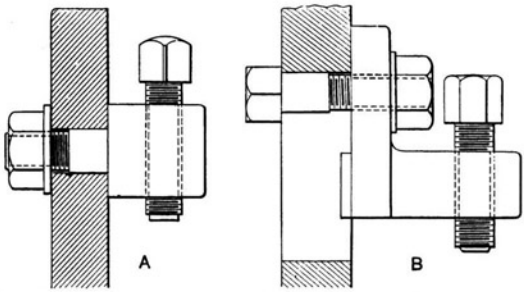
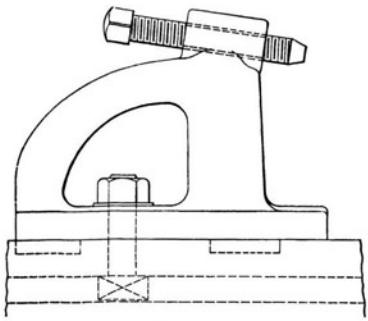


Fig. 1. Simple Screw Dogs on Faceplate

usually determines the form of chuck which shall be used, unless the work is of the plainest description. In the latter instance, an ordinary type of chuck with standard jaws is perhaps perfectly suitable. However, as soon as any complication in outline affecting chucking arises, it is necessary to devise a chuck, or make special jaws, which will facilitate gripping, lessen the time, and eliminate all risk of inaccuracies. In a shop doing the ordinary run of miscellaneous work the chucks will be all more or less standard, that is, modifications of a special nature will not be very noticeable. But in a highly specialised shop the number of strange shapes encountered is remarkable, and any one of them picked out at random would probably be suitable only for the particular kind of work it is handling. Occasionally, however, a chuck is designed with a certain degree of adaptability to cover a range of holds, thereby saving expense and storage room. The addition of one or more fitments or an adjustment obtained by placing screws or bolts in another set of holes is usually sufficient to meet requirements. Balance-weights also may have adjustability to two or three locations, placed accurately to suit the altered position of the same work or another piece of different size. The matter of whether a chuck shall be designed for one purpose only or for various uses is entirely dependent upon the number of pieces to be produced by it. The number of similar pieces to be produced affects the kind of chuck employed in a radical fashion, more particularly if the work is of moderate or small dimensions. In the latter case a spring type of chuck frequently suits better than one with sliding jaws, and is easier to operate and more convenient in some respects. Special collets are necessary to fit the work, and it is generally a simpler matter to arrange these in a spring chuck than in one with sliding jaws. But when the dimensions of the object exceed the capacity of spring chucks the matter is one for choice between a special chuck made to suit and false jaws fitted to a chuck of standard design.

Faceplate, Dogs and Holding Devices

For the purpose of these articles we shall take up the chucks where they begin, by the attachment of screw dogs to an ordinary faceplate, forming the primitive principle of gripping at



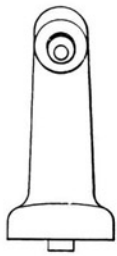


Fig. 2. Dog for Use on Boring Mill Table

the side of the work. At one time turners had no other assistance than that of the faceplate with dogs of a more or less makeshift type, and such things as proper sliding jaws accurately fitted were unknown. The work was held by the ends of screws, but as cuts were light, and time was of little importance, there was not the same need for rapid and powerful means of holding that present-day requirements demand. Neither was there any. self-centring principle available, and all work had to be adjusted tentatively. Even standard round shapes as drills and rods were held in bored chucks and clamped with screws, a method only met with now in the bell chucks. Though the method of using simple screws in dogs attached to a faceplate, as shown in Fig. 1, is still utilised largely among amateurs and to a lesser degree in the small shops, it is open to the objection of insecurity. The point or end of a screw affords only a small area, on which work is liable to swivel or skid. The surface, moreover, becomes impressed quickly, resulting in slackness while the turning or boring is in progress. With a jaw having three or more times the surface contact these difficulties are greatly diminished, and it is practicable to hold with continuity of pressure from beginning to end with little or no risk of slipping out of position, unless the object is exceptionally shaped, tapered, or has excessive overhang. The only merits of the screw dog device are its cheapness, since an ordinary faceplate may be employed. Practically the only instance where the screws possess any ad-

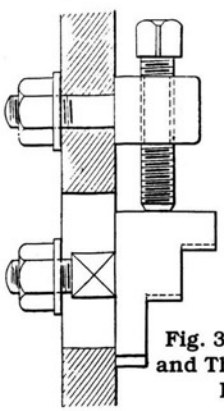


Fig. 3. Simple Dogs and Thrust Screw on Faceplate

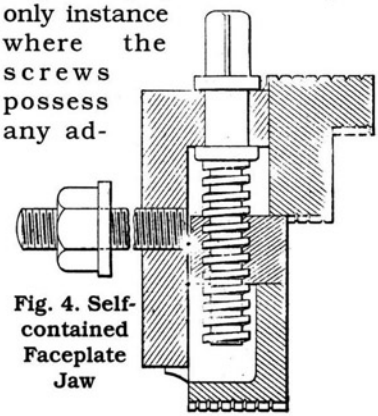


Fig. 4. Self-contained Faceplate Jaw

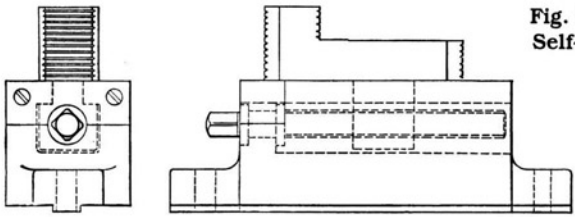


Fig. 5. Another Design of Self-contained Faceplate Jaw

vantage over proper jaws is their adaptability to reach into angles and recessed parts where space is limited. In a few cases it may be necessary to have unusually long screws, but generally quite short ones are employed, as in Fig. 1, since adjustments of more than a very short distance can be made by shifting the dog in its slot or to another hole. The amount to which a screw is set out from the surface of the plate depends on the class of work being handled; it is usual to have a double set of dogs, one set with the screw laid closely in, as at *A*, Fig. 1, and the other with the dog lengthened to bring it farther away, or made in the form of a miniature angle-plate *B*. It is not usual to set the screws at other than right-angles to the axis of the dog, because the work is more likely to slip; but in the case of the horizontal tables of boring and turning mills, gravity helps to keep the object down, and it is then practicable to set the screws at a slight angle, pointing downward. The dog is either plain, like that shown at A or B, Fig. 1, or elaborated into a 'higher casting, Fig. 2, to reach some way up the work and resist tilting. Should the work be shallow it can be packed up to make it come up to the range of the screws. Either three or four such dogs are utilised. Frequently they supplement the grip of the standard chuck jaws, the piece being first centred and gripped with these and the screw dogs brought up afterward.

A makeshift compromise between the screw dog and the regular jaw is to push the one along with the other, as in Fig. 3. It is a clumsy device, however, and not easy to manipulate, while for diameters approaching that of the faceplate it cannot be employed. The neatest device is the self-contained jaw, Fig. 4, comprising a base bolted to the faceplate, a jaw sliding in vees on the base, and a screw passing through the nut which is let into the jaw. Stronger designs are illustrated in Figs. 5 and 6, the first with a screw of medium diameter retained by thrust col-

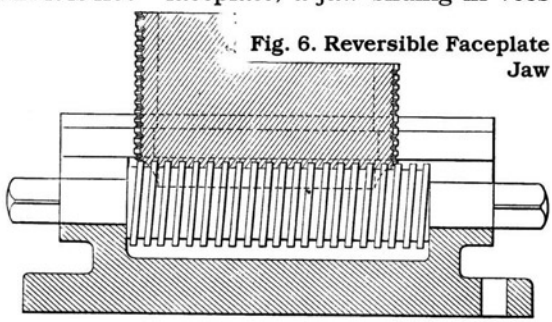


Fig. 6. Reversible Faceplate Jaw

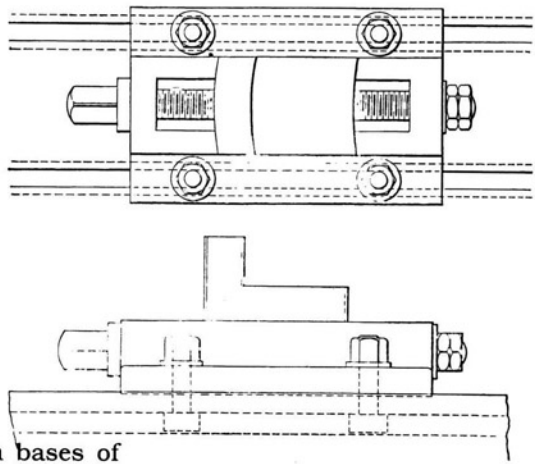


Fig. 7. Large Faceplate Jaw

lars, the other with a screw of more generous diameter and a jaw which can be run out at either end for reversal. As large flaceplates and boring-mill tables have double T-slots it is necessary to modify the bases of the jaws accordingly, as in Fig. 7. The largest plates are fitted with bases of sufficient length, Fig. 8, to give the full range of travel to the jaws, thus obviating the necessity for adjusting the bases. They are only touched when removal is required to leave the plate plain. In any type of jaw-fitting there is the disadvantage that the necessity for having a base makes the jaw stick out from the plate farther than when fitted direct to slots in the plate. A great many classes of objects, however, are secured with the help of bolts and clamps, supplementary to the grip of the jaws, so that the objection is not so important as it may seem.

A variety of special hooks or clamps is also used for certain work which is difficult to hold firmly, either on account of the small area available for gripping or because of a slight taper which tends to eject the piece when the vibration induced by cutting is set up. Fig. 9 shows a clamp combined with a jaw (for use in a tyre-boring mill) especially to secure the tyre firmly. The clamp is hinged to throw down out of the way. Another way in which part of the severe duty is taken from a set of jaws is that of adding one or more driver pins, set either directly in the faceplate or into massive castings bolted thereto.

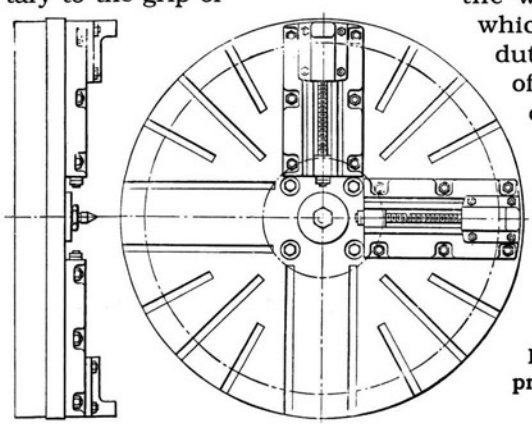
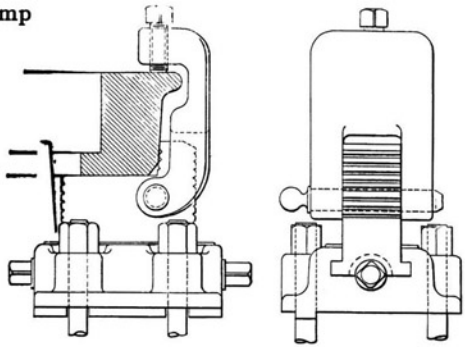


Fig. 8. Heavy Faceplate provided with Reversible Jaws

Fig. 9. Jaws with Pivoted Clamp



These pins engage with arms or other projections, and afford a positive drive. Sometimes, also, when an extremely heavy cut has to be taken from a bar or shaft, the hold of ordinary jaws is supplemented by the application of three or four massive screw dogs of the type shown at *A*, Fig. 10, which are very heavy and held with two or three bolts.

Independent Jaw Chuck

The standard independent jaw chuck is directly related to the faceplate fitted with a set of loose jaws, the only difference being that the jaws are fitted directly into the plate and the screws are built in, as shown in Fig. 11. There is a good deal of variation in detail, especially in regard to methods of taking the thrust of the screws. In the first example shown the screws are laid in from the front, which necessitates an open slot; but a more workmanlike way is to take the thrust a little way inside the hole by means of a loose collar *A*, Fig. 10, slipped in after the screw has been inserted endwise, and secured with a couple of pins fitting half-way in the chuck and half-way in the collar. Or the screw collar is brought farther in, resting against a shoulder, and the loose collar is laid in as at *B*, Fig. 10; this is an alternative to using the tail of the screw to receive the thrust in one direction. Instead of a plain collar, however, a threaded one may be used which can be tightened to make an exact working fit without backlash and which is locked with a lateral screw; this device permits of later adjustments to eliminate backlash due to wear, as shown at *C*, Fig. 10. It will be noticed that the essential difference between this class of chuck and the various types of modern chucks now on the market is the way in which the jaws are fitted into the body. The chucks thus far described take a bearing by the squared tail, but in the modern types the chuck bodies are grooved to receive the tongued bases of the jaws, resulting in a much better fit and greater re-

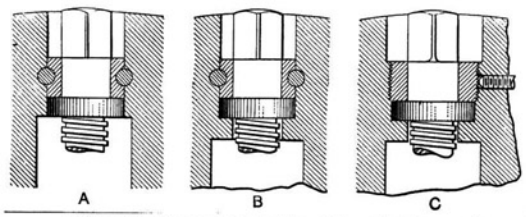


Fig. 10. Screws retained by Collars of Various Types

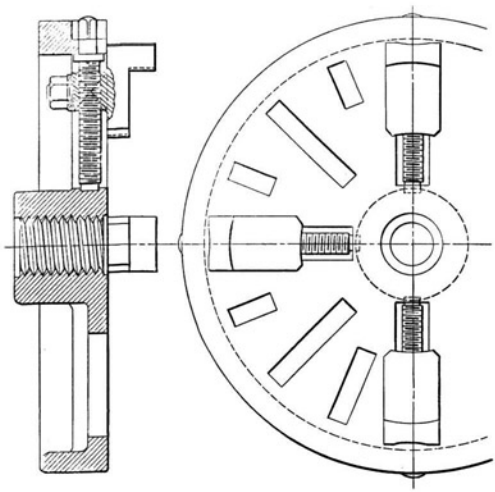


Fig. 11. Independent Jaw Chuck

upon which the jaw may be rotated. The driving screw is given a slight amount of play, as shown in Fig. 13, so that when the nut at the back is slackened the jaw and shank may be pulled out sufficiently to clear the tongue on the under side of the jaw, making it possible to reverse the jaw.

The design of independent jaw chucks with tongued jaws, Fig. 14, is employed now to a far greater extent than the other class previously described. The screws are of large diameter, and the tendency of modern practice has been to increase thicknesses of metal in the body, width of jaws, and to use steel bodies or cast-iron bodies reinforced with steel. Modern practice is rapidly tending also to continue the threaded portion of the screw at the outer end, Fig. 14, to the outside periphery of the chuck. This necessitates modifying the method of taking the end thrust of the screw that is, transferring the lo-

sistance against lateral pressures. It is now the practice in making oldfashioned independent jaw chucks to recess the jaws slightly in the body, which tends to keep them in line and to relieve the pressure from the screw stud end, as illustrated in Fig. 12. But this does not overcome the tendency to tip over; hence the necessity for the screwed tail and nut at the back.

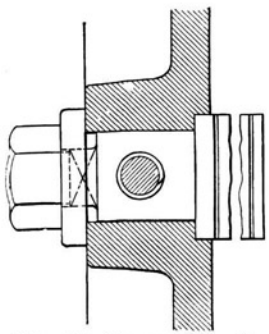


Fig. 12. Jaw recessed slightly into Plate

Reversible jaws on the independent jaw chucks of the class just illustrated are arranged upon a kind of stud, corresponding to the shank of an ordinary jaw, but with a circular portion

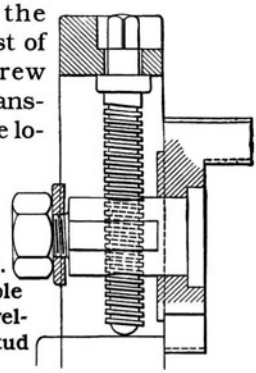


Fig. 13. Reversible Jaw swiveling on Stud

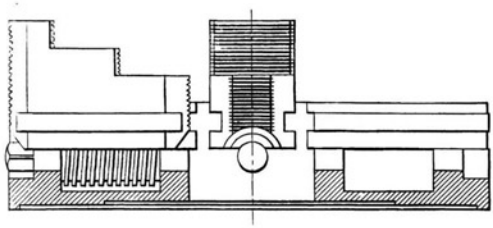


Fig. 14. Heavy Independent Jaw Chuck with Tongued Jaws

cation of the thrust bearing to a position about half-way down the screw. A thrust pad or plug is generally inserted from the back and secured with a screw or screws set at its side or centrally. The use of a thrust pad is advantageous from the point of view of durability, since it can be hardened and so form a medium that is greatly superior to any portion of the chuck itself for resisting wear. The Cushman thrust pads are split and expanded into their seatings with a taper-headed screw. The Horton chucks employ a tapered block A, Fig. 15. A peculiar arrangement is seen in the design of the Oneida National Chuck Co.; here, as shown at B, Fig. 15, a steel ring is laid in the mould and incorporated in the casting when pouring, thus forming a powerful reinforcement to resist the outward strain imposed when the work is gripped. Where the thrust shoulders of the screws come they lap over this ring, so that the thrust is received by it.

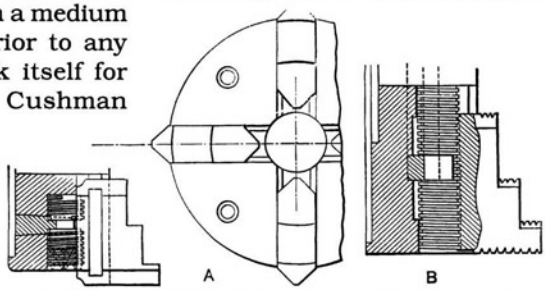


Fig. 15. A – Horton Chuck Jaw with Tapered Block B – Oneida Chuck with Thrust Ring

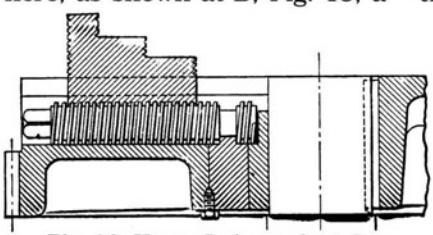


Fig. 16. Heavy Independent Jaw Chuck with Spur Gear Drive

Holes and slots of through or T-slot type are variously made in independent jaw chucks for the reception of bolts, the precise arrangement often depending on the size of the chuck. In the larger chucks for heavy lathes and for boring mills the number of T-slots is increased, and frequently the jaws do but a fraction of the work of holding, the major part being undertaken by bolts, clamps, and driver pins. A ring of teeth for driving a heavy plate is either bolted upon the back or is cut solidly as in Fig. 16. Increased stability and wearing capacity of jaws is obtained by widening and deepening them, thus enlarging the wearing areas and affording better resistance against tipping. The Horton widened jaw with

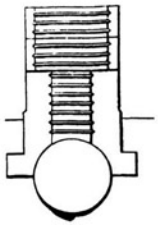


Fig. 17. Jaw with Wide Base

ranged base, Fig. 17, offers a radical departure from the ordinary grooved jaw, and is well adapted to severe service. The effect of the increased width of base on the size of the screw is that it can be greatly increased in diameter. The Union Mfg. Co. has a system of double ribs in its heavy type chucks, shown in Fig. 18, the jaws, of course, entering more deeply from the chuck face than usual.

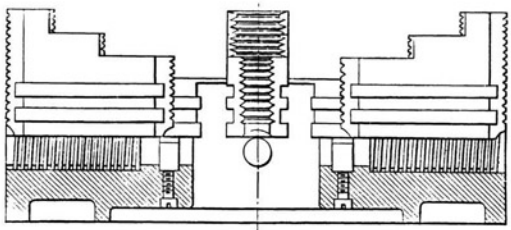


Fig. 18. Union Double Tongued Jaws

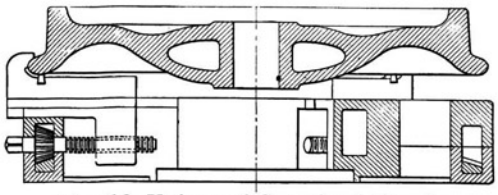


Fig. 19. Universal Car-wheel Chuck

Concentric or Universal Chuck

Although independent jaw chucks have a series of circles struck upon the face for centring the various jaws approximately, this method lacks accuracy and speed when there are many of the same pieces to be chucked. The simultaneous operation of the jaws is highly essential for this class of work, and this is provided by the concentric or universal chucks. Two methods are in use for effecting the movement of the jaws in unison. One is to connect each screw with a bevel gear meshing with its pinion, and the other is to abolish the screws and move the jaws directly by a scroll plate engaging with teeth on the back of the jaws. Rotation of the scroll plate is effected either by direct hand or lever pressure, or through the medium of gears. The objection to the screw method is the tendency to wear in the threads, which introduces backlash, rendering exact concentric action unlikely after a little use. The strain on the circular rack and the pinions is

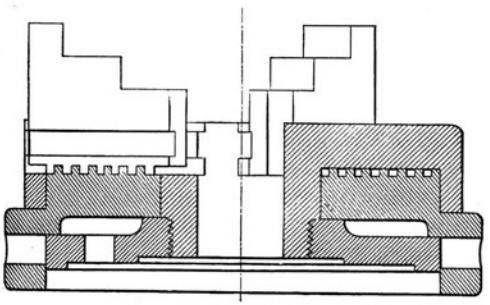


Fig. 20. Lever Scroll Chuck

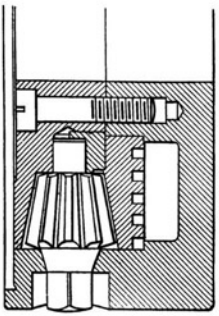


Fig. 21. Pinion with Tapered Journal

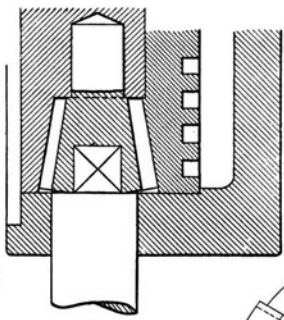


Fig. 22. Pinion Wrench turning in Chuck Hole

to the scroll becomes essential. In most instances bevel gears are utilised. There is one exception where worm-gears are employed, and another the Westcott where spur gears are fitted, both designs being intended to increase the power. The ends of a bevel pinion usually run in parallel bearings, but an exception may be observed in Fig. 21. Here it will be noticed that the outer bearing is of coned form so that the backward thrust of the pinion always makes the tapered bearing fit without shake. Another variation is met with in the Whiton practice; here the key is formed to act as a part bearing, Fig. 22. The latest pattern of Horton chuck offers a modified arrangement of pinion bearing, seen in Fig. 23, the outer end of the pinion being nearly as large as the outer diameter of the teeth, so as to allow of a very large hole for the powerful wrench which is employed. A thrust ring is placed as shown

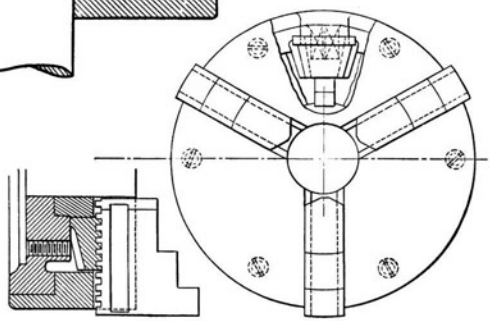


Fig. 23. Horton Universal Chuck with Large Wrench Socket in Pinions

also very severe, and for this reason it is advisable to only lightly tighten one pinion to set the jaws upon the work and then go round and set up each screw hard with its own square, pursuing the reverse method when loosening the work. Fig. 19 will serve to show the principle of the geared screw design of universal chuck, this being a type of car-wheel chuck made by the E. Horton & Son Co.

What are termed lever scroll chucks are the weakest from the point of view of tightening; the scroll ring is rotated either by the grip of the fingers on a knurled rim or by means of a tommy-rod inserted in a hole in the rim. These chucks, Fig. 20, are used by amateurs and light lathe workers, and are very handy for work within their power because of the ease with which tightening and releasing is done. But there is a definite limit to the gripping power, and a gear drive

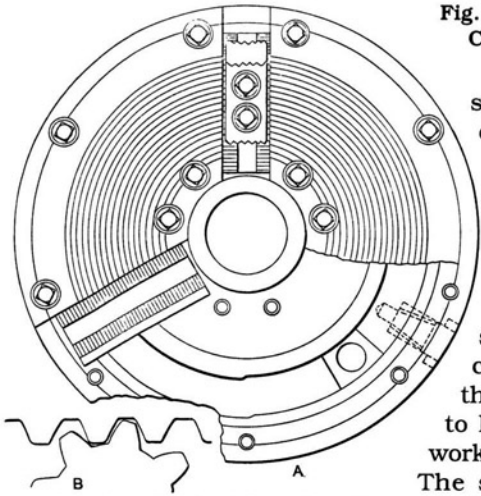


Fig. 24. Concentric Chuck with Cam Ring instead of Scroll

to afford sufficient bearing for the backward pressure. It may be mentioned that the teeth used are of the Brown & Sharpe stub form, and this strong shape, in conjunction with the fact that the pinion is of heat-treated steel, oil-hardened, makes for great durability.

Messrs. Alfred Herbert, Ltd., of Coventry, manufacture a concentric chuck *A*, Fig. 24, which differs radically from all others by the fact that a spiral is not used, but three eccentric grooves are formed in a ring. In these grooves three sliding blocks are confined, which, in turn, are attached to three T-slides. These T-slides have serrated faces which fit into numerous serrations on the jaws, and are held in place by two screws. As the sliding blocks fit the short eccentric grooves exactly at all positions they do not suffer from the disabilities incurred in trying to make a jaw of constant curvature match the varying radii of a spiral comprising many circles, as is the case in a scroll chuck. The jaws, which are reversible on the slides, may be adjusted to and from the centre by slacking the two holding screws half a turn and resetting by matching the accurately cut serrations. With this device it is also possible to hold eccentric or irregular work as well as concentric work. The standard jaws furnished cover the range of all diameters of the chuck with two steps only. Heat-treated chrome-nickel alloy steel is employed for the pinions, which have eight teeth of the shape shown at *B*, Fig. 24, and the ring carrying the teeth and eccentric grooves is of heat-treated steel, ground in the hole. Three sector plates, dowelled and screwed on, constitute the face of the chuck, and they carry the numbered circles by which the jaws are set concentrically.

Although this design of chuck does not provide for running the jaws in or out any distance (as an ordinary scroll chuck does), it is claimed that modifications in diameters are more quickly and easily made by the slackening of the screws already mentioned than by tedious running in or out. The chuck is not intended to compete with light, cheap kinds, of course, but is for the heaviest service, built in capacities from 12 to 25 inches.

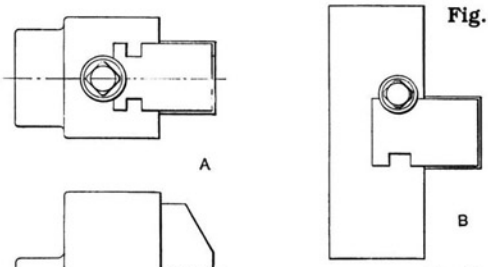


Fig. 25. Brass Finisher's Chuck

Another distinct departure from ordinary design is the Taylor "spiral" chuck which, instead of having the scroll teeth cut upon a plane face, has them made in a hollow cone, Fig. 26, and of V-section. They present a backing to the teeth of the jaws directly in line with the pressure, and more than half the pressure is taken by solid metal. It is possible to use a much finer pitch of spiral

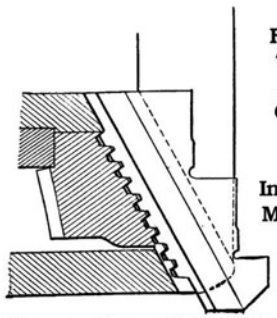


Fig. 26. Taylor Spiral Chuck with Jaws Inclinably Mounted

than in the ordinary design, and the threads can be hardened and ground, both in ring and jaw. The jaws necessarily slide down inclined grooves, and this, incidentally, has the beneficial effect of partly masking them within the chuck cone so that there is less liability for them to catch in workmen's clothes or hands.

Chucks with two jaws only are not so frequently operated with a scroll as with a screw. When using the screw there is no need to have a complete round body, and the sides can be flat, constituting a box body, which saves weight and is mere convenient for holding certain classes of work. An independent jaw box-body chuck has the jaws moved by separate screws, but a universal jaw type has a single screw with right and left-hand ends. The location of the screw

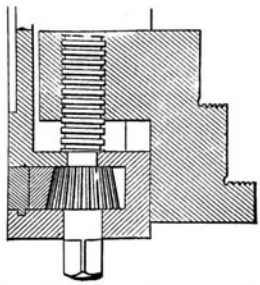


Fig. 27. Combination Chuck with Revolving Ring behind Back

determines whether the work may pass by the jaws into the chuck body or not. If the screw is set centrally, *A*, Fig. 25, it obstructs the passage; but if at the side, *B*, there is nothing to prevent the work from extending into the body.

Combination Chucks

In a universal chuck of the scroll type the radial movement of the jaws is produced solely by the rotation of the scroll, and the labour, wear, and time incurred by this procedure in large chucks is highly objectionable. This has brought about the practice (in

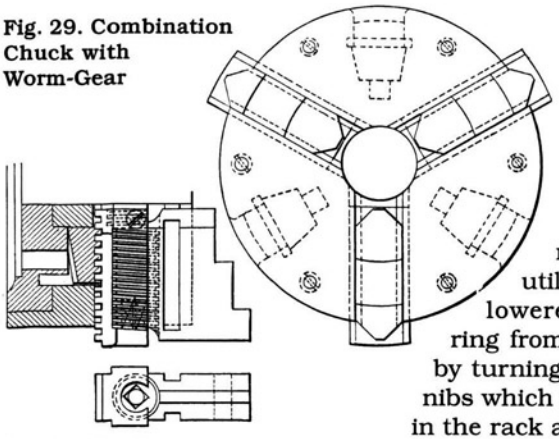


Fig. 29. Combination Chuck with Worm-Gear

chucks for boring and turning mills) of mounting the jaws with interlocking serrations on the faces of separate slides which mesh with the scroll. This gives provision for rapid loosening of the jaws and their transition to or from the centre, in the same manner as in the Herbert chuck previously illustrated.

Having seen the principles of operation of both independent and universal chucks, we will now consider a type which affords a useful blending of the two kinds, the combination chuck. This, as its name implies, provides either independent or universal movements of the jaws, as desired. Two devices are in common use for attaining this end, one being to employ geared screws and arrange the rack so that it may be dropped out of mesh and each screw turned independently; and the other to use a scroll, but give each jaw a separate movement by an independent screw. When the rack device is utilised it is generally lowered by removing a ring from the back of it, or by turning a ring with raised nibs which enter into recesses in the rack and allow the latter to drop sufficiently. In a Pratt & Whitney design, Fig. 27, the ring is grooved so that when partly revolved it lowers the rack out of engagement. The Westcott chucks have a ring provided with concave places underneath to fit over lugs standing up in the back of the chuck, and provision is made to partly rotate the ring and bring the straight back on to these lugs, thus raising the rack into gear with the pinions. Several chucks are designed on this general principle. The scroll and screw design also finds much favour, an example being

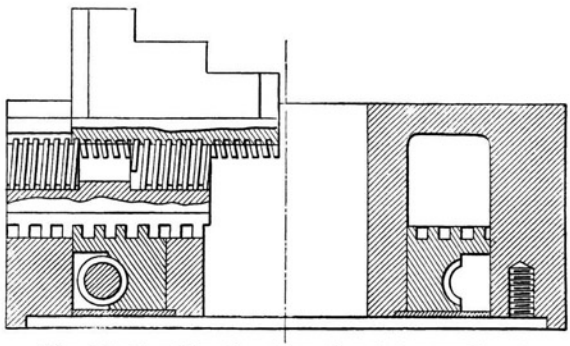


Fig. 28. Combination Scroll and Screw Chuck

seen in Fig. 28 (Horton), with very large screws. Another chuck, with screws having a central thrust collar and a worm-gear for turning the scroll, is shown in Fig. 29.

The combination chuck is disparaged by some, but it nevertheless fills a useful sphere, particularly in eases where the expense of two separate chucks is objected to, or the trouble of changing one for another frequently arises. Some general runs of work require frequent changes from a universal to an independent chuck, and vice versa.

Lathe Chucks – II

A Review of Faceplate and Collect Work-Holders

BY JOSEPH HORNER A.M.I. MECH. E.

MACHINERY MAGAZINE – JUNE 22, 1916

Chucks which do not resemble the faceplate in primitive outline constitute a very large class. Roughly speaking, they hold small diameters rather than large, and pieces long in proportion to their diameter. The old bell-chuck, Fig. 30, may be taken as typical of the principle, though it is clumsy and awkward to use, and the same result is secured in other ways more efficiently. The standard form of bell-chuck, shown with eight screws in the illustration, is still largely used. At times the screws are guarded by thickening the metal considerably and sinking the heads into the wall. This chuck is most useful when it is made especially to suit some piece of work that is awkward to hold in any other way. Fig. 31 shows a special bell-chuck with a bushing at the back, and other instances might be illustrated of long work outside the normal range of an ordinary jaw chuck being handled in a chuck of this type. The practice of using laterally adjustable screws for the purpose of tightening is also found in the special brass-finishers' "clambs," Fig. 32 and Fig. 34, to which suitable false jaws are screwed.

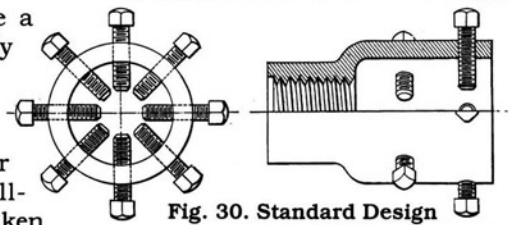


Fig. 30. Standard Design of Bell-chuck

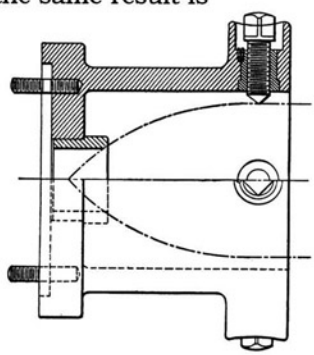


Fig. 31. Bell-chuck with Centring Bushing

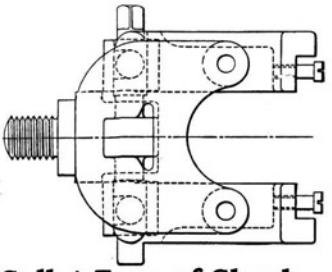


Fig. 32. Self-centring "Clamb"

Collet Type of Chuck

The most commonly used and convenient arrangement, however, for gripping pieces that are long in relation to their diameter is the collet type of chuck, employing jaws which are closed in by the action of a taper outside. There are two chief forms, one with loose "grips" or collet segments held by an annular collar, and the other of the spring type which opens of itself when released. A great many British turret lathes are provided with the first-named style, and require the use of a large wrench to tighten and loosen the cap which operates the grips. Sometimes a hand worm-gear drive is used instead, and the action can also be made automatic by

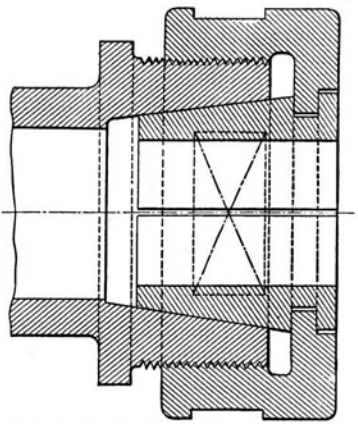
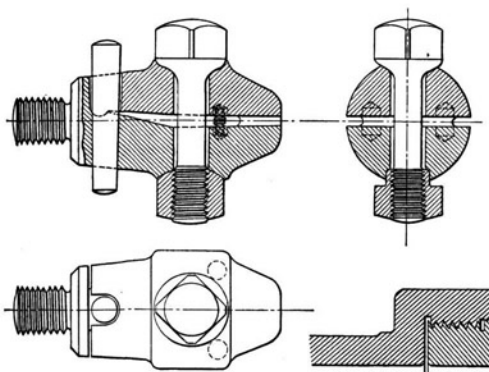
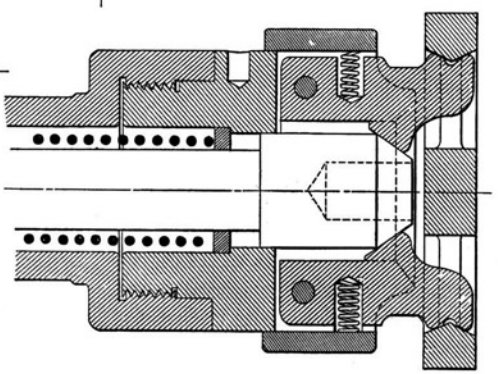


Fig. 33. Collet Chuck operated by Wrench

means of gears from the headstock. In heavy lathes this becomes essential because of the amount of power required for tightening and releasing. The principle may be observed from Fig. 33,



(above) Fig. 34. Brass Finishers' "Clamb"



(right) Fig. 35. Special Pivoted Jaws operated by Push-out Rod

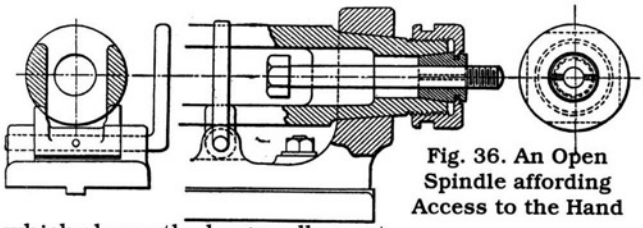
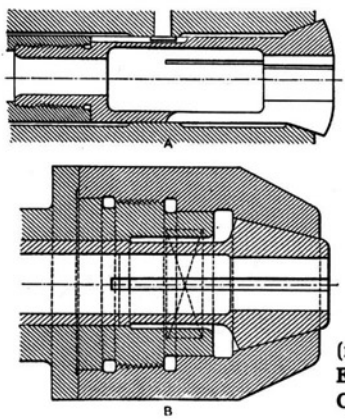


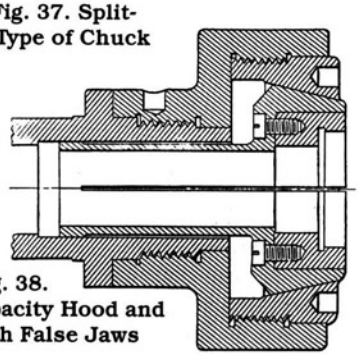
Fig. 36. An Open Spindle affording Access to the Hand

which shows the large collar nut fitting the spindle, the collar engaging with the grooves in the grips. The grips are comprised of a complete collet divided into three portions, so that when the nut is tightened the grips are forced inward and closed round the bar. In some cases the bore is threaded to hold screwed pieces. Fig. 36 illustrates the "open spindle," having a space for the hand to reach in and push the bar forward, or to receive a head or other enlarged part of the work. The lever with stop blocks is thrown into action when the spindle has to be held immovably while the wrench is in use on the chuck nut. A set of grips with bores covering the desired range is furnished. When more rapid action is desired on a comparatively light chuck a sliding collar is arranged in place of the screwed nut, and is slid by a lever forward or backward while the spindle is running.

The split chuck is the most popular device for gripping, of the class mentioned, and is fitted to bench lathes various sizes of turret lathes, and to automatics. The precise mode of operation varies widely according to individual ideas, and in some degree to the size of the lathe. Thus in a watch maker's or a bench lathe a movement by a handwheel is sufficient, so that the act of turning the wheel also rotates the tube and draws the chuck in by the action of the threaded tail as at *A*, Fig. 37. Tool-room lathes are also arranged to include a draw-in chuck, but in this case, when the spindle nose is not bored specially, an adapter is required to act as a closer. Some turret lathes are preferably constructed

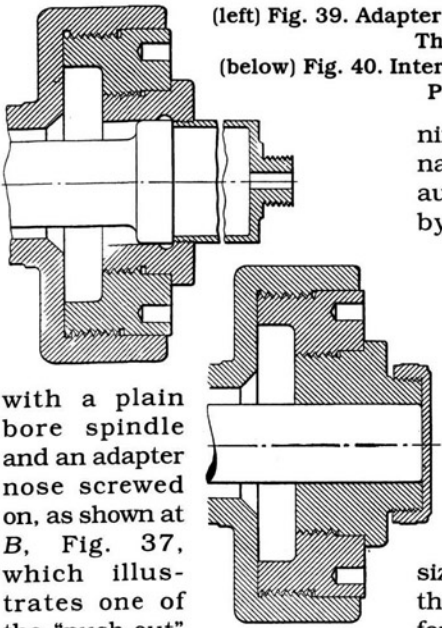


(left) Fig. 37. Split-spring Type of Chuck



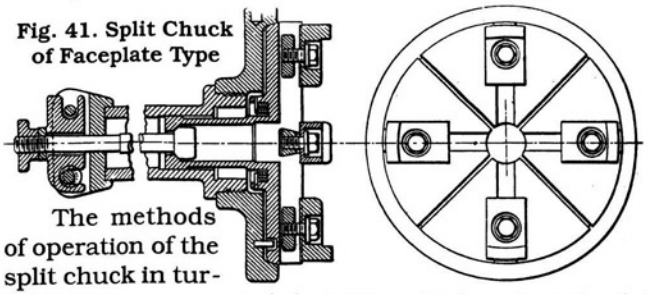
(right) Fig. 38. Extra Capacity Hood and Collet with False Jaws

(left) Fig. 39. Adapter Ring and Push-out Rod to hold Threaded Work
(below) Fig. 40. Internally Threaded Work locked by Push-out Rod



with a plain bore spindle and an adapter nose screwed on, as shown at *B*, Fig. 37, which illustrates one of the "push-out" variety.

Fig. 41. Split Chuck of Faceplate Type



The methods of operation of the split chuck in turret lathes are so varied that it is out of the question to attempt to illustrate this section of the subject adequately. Generally speaking however, they all depend on some modification of Park–hurst method of action, comprising toggles opened by sliding collar, the toggles acting on the draw-in or push-out tube. The object of the sliding collar is to provide a mechanism that can be operated while the spindle is running, the collar is slid longitudinally either by a hand-lever or automatics by a device operated by cams. Wire or bar-feed mechanisms also offer some complicated details, ranging the simpler weight feed to the hand or power tube feed and the more elaborated roller feeds. The split chuck is capable of a wide range of capacities and capabilities when fitted with suitable liners, lets, or false jaws. These may hold unusual shapes, or sizes beyond normal capacity of the lathe spindle. Larger hoods, for instance, supply the means of fitting an abnormal chuck, Fig. 38, to which are attached specially shaped liners. The capacity can still further increased as in Fig. 42 bringing the false jaws outside. The extreme in this direction is seen in the

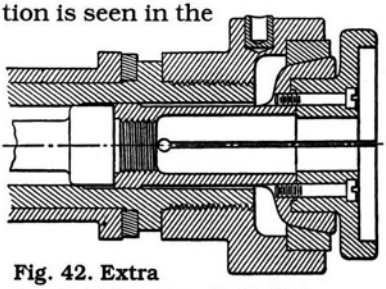
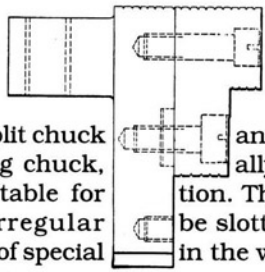
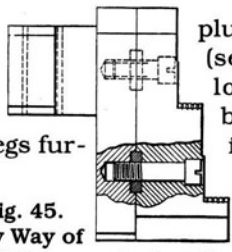


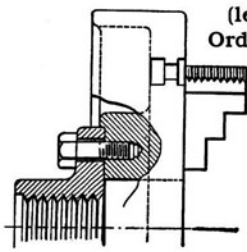
Fig. 42. Extra Large False Jaws in Collet

"stepped," "disc," or "wheel" Fig. 53, while a handy kind of modification, Fig. 41, combines the action of a split chuck with the jaws of a dog chuck, the jaws being adjustable for concentric or for irregular shapes. The inclusion of special fingers jaws, as illustrated by the example, Fig. 35, is another extensive method of providing for gripping special shapes the outside or inside, the plunger of the chuck giving required action for forcing the jaws against the piece. Simple studs or pegs furnish another means of holding work with openings, the studs entering the opening and being pressed laterally by the closing operation. The nose of a collet may be slotted to fit into openings in the work and act in a similar manner. It is not always necessary to exercise a gripping action on screwed objects, and the endwise movement of a plunger is often utilised (see Fig. 39) simply to lock work which has been screwed by hand into the adapter, An internally threaded piece is locked by a plunger, or push out rod, entering it and forcing it outward to tighten the hold of the threads, as shown in the illustration, Fig. 40.

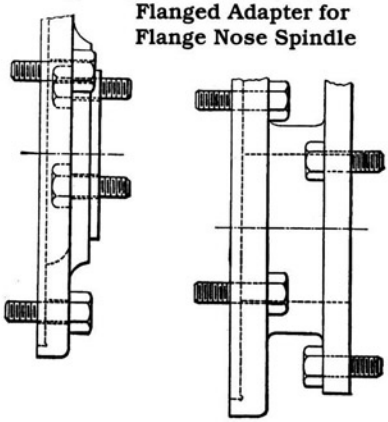


(above) Fig. 43. Reversible False Jaw with Stud (below) Fig. 44. Reversible Jaw with Dowel Washers





(left) Fig. 45. Ordinary Way of fitting Chuck to Lathe Spindle with Adapter (below left) Fig. 46. Adapter to fit Small Chuck to Flanged Spindle (below) Fig. 47. Flanged Adapter for Flange Nose Spindle



Shapes of Chuck Jaws

Consider now some of the variations in form in which the regular chuck jaws occur. The three common shapes of standard jaws, Fig. 48, are well known, and serve for gripping work up to the largest capacity of the chuck by the outside and by the inside. The form without steps is used chiefly for rods and tubes, where its smooth back is safer. Blank jaws are simply rectangular in outline and are finished to shape according to the work to be held. A frequent practice is that of fitting a separate top or false jaw to a scroll toothed

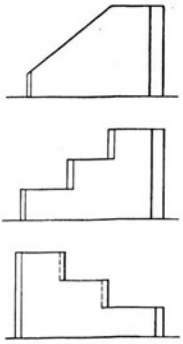
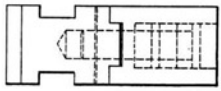


Fig. 48. Common Forms of Jaws

base, Fig. 49, so that it may be cut to outline, and when not wanted another top can be substituted in its place. Alternatively, a false top is screwed to the steps of an ordinary jaw and cut to outline. The necessity for providing holding means for both inside and outside grips is solved in one of three ways: (1) a separate set of jaws is reserved for each function; (2) the same jaws are reversed in the chuck slots; and (3) separate tops or false jaws are fitted to non-reversible bases, and are turned end for end to reverse. The second practice is easy when the jaws can be run out at the ends such as in Fig. 14 in the first instalment of this article and the steps are cut off suitably at the corners to adapt them for inside and outside contact. But if the screw and whole nut type of jaw is employed, this is not practical and the false jaw method must be adopted.



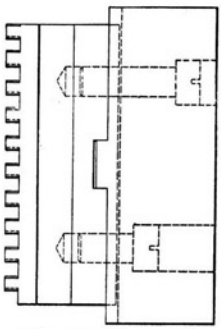
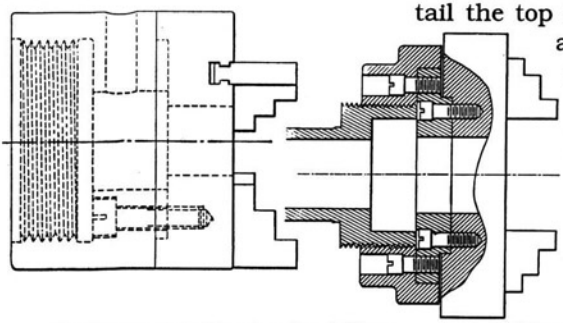
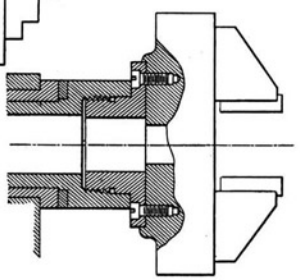


Fig. 49. Jaw with False Top

The false jaw method shown in Fig. 43 is the Union Mfg. Co.'s device, held by a dowel and two screws. Fig. 44, which shows the Skinner chuck, is a variation of the above mentioned practice, inasmuch as the thrust is received by washers entering half-way in jaw and top. Another way is to dovetail the top into the base. Still another is to fit it over the ends of the base, screws being added in each instance. It is not practicable to reverse the jaw in a





(left) Fig. 50. Adapter for fitting Small Chuck to Large Spindle (middle) Fig. 51. Small Chuck fitted to Lathe Spindle with Special Adapter (right) Fig. 52. Chuck with Adapter fitted to Inside of Spindle Nose

scroll chuck, because of the curvature of the teeth in the jaw. This can only be done in the special Sweetland jaw, which has lozenge-shaped teeth to fit the scroll either way. Otherwise a false jaw has to be fitted to it, one method being illustrated in Fig. 54 – from Whiton practice – with dovetails and a screw. The screw is omitted in the light chucks, and the dovetail joint is sunk to a level below the chuck slot, so that the sides of the latter prevent lateral misplacement. In this case it is necessary to run the jaws out for reversing the tops. Jaws grooved or cut out to special forms to match parts of work are very common in the two-jaw or brass-finishers variety of chuck. It is not necessary, easy, or convenient to utilise three or four jaws for this service. The most that is done in three- or four-jaw chucks is to turn a recess on the inside or

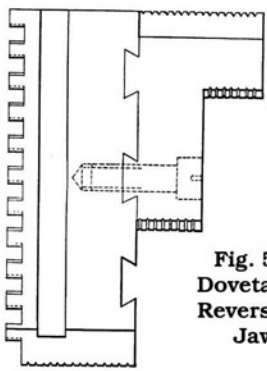
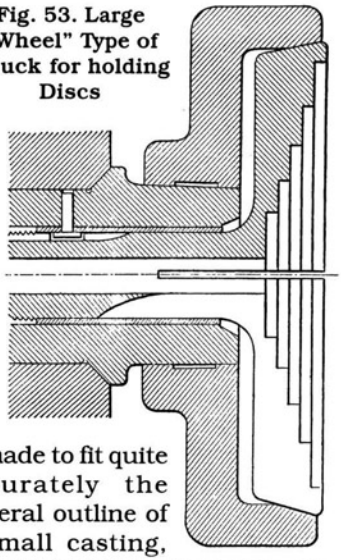


Fig. 54. Dovetailed Reversible Jaw

outside of the jaws to match the cross-section of the work, and to locate and grip it thereby. In the two jaws mentioned much more is done, and the cutting out may resemble a mould or a die, which

Fig. 53. Large "Wheel" Type of Chuck for holding Discs



is made to fit quite accurately the general outline of a small casting, thereby holding it very securely. The recessing is done in loose slip jaws which are dove tailed to the real jaws. On the European Continent a chuck of novel design is quite extensively used. It is virtu ally a two-jaw chuck, but on each jaw is mounted a disc or turret, on the peripheries of which are cut suitable recesses to hold from five to seven different shaped pieces. To grip a different shaped piece it is only necessary to revolve the discs till the corresponding recesses are opposite one another. This saves set-up time by comparison with the single-purpose slip jaws. Apart from these special two-jaw chucks, the normal number of jaws on chucks is three or four (drill chucks excepted). Three jaws should give perfect results theoretically, but actually they do not afford the same power of grip that four do, neither do they get the same general average of

the roundness of a slightly irregular piece. On the other hand, a universal chuck with four jaws may not give its full advantage if the work is slightly out of round, because two opposite jaws will do most or all of the work. This is not the case with an independent chuck, since the jaws are all set against the work separately and an equal pressure is ensured. An uncommon style of chuck may be mentioned. It is of the regular three-jaw design except that an extra jaw is inserted diametrically opposite one of the other jaws. In this way it may be converted into a two jaw chuck for work that is suitable. When this is in use the two flanking jaws are, of course, unoccupied. More than four jaws are fitted to chucks chiefly when it is desired to get the truest average of a slightly irregular object and to hold it with the greatest security. Some ear-wheel chucks are so provided.

Attachment of Chuck

There is much variety in the methods of fitting chucks to lathe spindles, depending on the type and size. The standard method is to fit a back-plate or adapter threaded to match the spindle nose, and unite this to the chuck with screws or bolts. The recess in the back of the chuck, see Fig. 45, affords accurate centring. To avoid the undue overhang of a heavy chuck, the plate may be reversed, with its boss projecting into the chuck bore. On a large flange nose spindle an adapter of the kind shown in Fig. 47 is often used, or if the chuck is small the adapter is modified as in Fig. 46. Fig. 50 represents a special adapter for mounting a small chuck on a large spindle, an occasional requirement when large hollow-spindle lathes are used. Figs. 51 and 52 are alternative methods of mounting chucks with adapters, that shown in Fig. 52 being screwed inside the spindle nose, which ordinarily is employed for a split chuck.

Direct attachment of chucks that is, without the intervention of an adapter, is done chiefly in the ease of the common jaw chucks. Direct fitting is, of course, done in the case of the small chucks which are screwed over or into the spindle nose, but these are mostly of small capacity. A taper arbor is used for small rod chucks and drill chucks.

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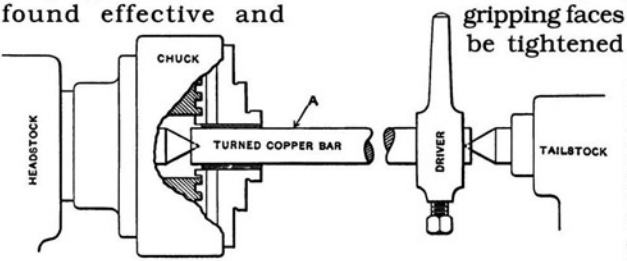
Truing Jaws Of Scroll Chucks

Letters on Practical Subjects

MACHINERY MAGAZINE – SEPTEMBER 28, 1916

The method of truing up the inner gripping surfaces of scroll chuck jaws, shown in the accompanying illustration, has been found effective and



much cheaper, quicker and more accurate than the use of an internal grinding attachment. If the jaws are trued up by an internal grinding wheel, they will be more or less slack during the truing process, and will probably run considerably out of truth when tightened on to the work. In using the method shown in the accompanying illustration, the live centres of the lathe must run perfectly true, and must not project beyond the inner face of the chuck jaws. The copper bar *A* must be turned cylindrical for a few inches near the headstock, and a large driver must be attached to the tailstock. Over the turned length of the bar, carborundum powder and lard oil or some other equally good lapping compound should be evenly spread, taking care, at the same time, to keep the compound away from the live centre. The chuck jaws may then be tightened so as to grip the bar lightly and the lathe started while the bar is prevented from turning by the driver.

As the lapping proceeds, the gripping faces of the jaws can be tightened up, adding a little paraffin and more lapping compound if necessary from time to time until the faces of the jaws have been properly trued. It is advisable to apply only light pressure to the jaws at first, but after the carborundum has been ground down fine, the work should be finished under the greatest pressure possible without absolutely gripping the lap. This is done to force the teeth of the jaws against the scroll of the chuck as firmly as possible, so there will be no backlash. Care must also be taken to see that the copper lap is held firmly between the lathe centres. As the lap can withstand considerable pressure, the work will be more accurate than when a grinding wheel is used.

R. G. E.

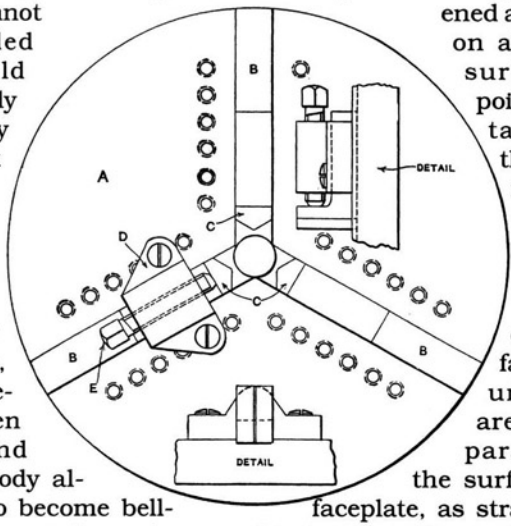
[It is evident that a copper bushing could be used in place of the solid copper bar if desired. The bar could be of steel and the bushing forced on to one end and turned in position, since the present cost of copper is high. EDITOR.]

Accurate Lathe Chuck

Letters on Practical Subjects

MACHINERY MAGAZINE – OCTOBER 26, 1916

The jaws of the average lathe chuck seldom have a bearing for their full length on the piece of work which they are holding, and therefore cannot be depended upon to hold work perfectly square. They may work fairly well while new if they have been perfectly fitted, but they soon wear, and the looseness between the jaws and the chuck body allows them to become bell-mouthed when tightened on a piece of work.



The need of a chuck which could be easily kept true led to the design shown in the accompanying illustration, which shows a set of auxiliary jaws fitted to a bench lathe faceplate. *A* is the faceplate in which have been cut the shallow grooves *B* that the jaws *C* slide in. *D* is the strap which holds the jaws in place and carries the adjusting screw *E*. The strap is held to the faceplate by screws that enter tapped holes, as indicated, spaced to allow for shifting the strap to different positions as shown.

The illustration is clear enough to show the principle, but it is well to note that the chuck jaws and strap are hardened and ground on all wearing surfaces or points of contact, while the grooves in the faceplate are either scraped or ground on the surface grinder until they are perfectly parallel with the surface of the faceplate, as strap *D* must bind sufficiently on the jaws so that when the screws are drawn down tight the jaws will be a tight sliding fit. Special jaws for holding odd shaped or thin pieces can be easily made up, while any wear on the jaw faces can be remedied by regrinding on a surface grinder. While designed originally for use on a bench lathe faceplate for holding pieces that had to be turned, bored or ground accurately, there is no reason why the same principle cannot be applied to heavier work, It would prove cheaper and more accurate than the regular chucks on a large variety of work.

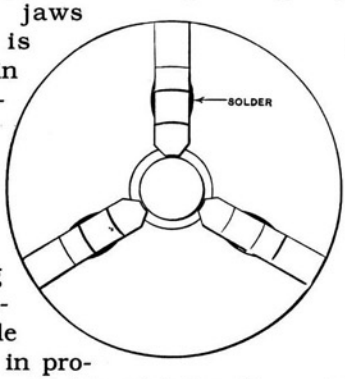
D.B.

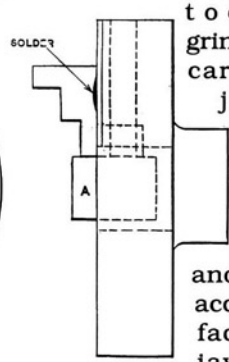
Grinding Chuck Jaws

Letters on Practical Subjects

MACHINERY MAGAZINE – NOVEMBER 16, 1916

The article in the September 28 number of MACHINERY on truing up the jaws of scroll chucks reminded the writer of a very satisfactory method of grinding chuck jaws which is in use in the toolroom where he is employed. Having had considerable trouble in producing a good true job by other means, it occurred to the writer that the desired result could be reached by gripping a cylindrical piece *A*, shown in the accompanying illustration, in the chuck with a fair pressure, lightly soldering each jaw to the face of the chuck, and the driving piece A carefully out of the jaws. This leaves all the steps open and free to be ground by a tool-post grinder on the carriage, the jaws being left in the position in which they grip the work, and produces accurate surfaces on the jaws. After grinding the solder can be easily scraped from the surface of the chuck. If preferred, the jaws could be soldered to a small brass or steel angle instead of in the joint, which would facilitate removal of the solder. C.L.





Truing Chuck Jaws

Letters on Practical Subjects

MACHINERY MAGAZINE – JANUARY 25, 1917

The efficiency of the method of truing chuck jaws described by R.G.E. in your issue of September 28 is very much open to question. Those who have had a long experience in lapping know that a lap without longitudinal movement, working on a broken uneven surface, will soon become scored, and unless it is repeatedly skimmed up, it will not produce the finish claimed for it. R.G.E. points out that if the jaws are trued by an internal grinding wheel, they will be more or less slack during the truing process. But there is no need for the jaws to be slack during the truing operation, for there are many ways by which this slackness

can be prevented. The methods described in Figs. 1 and 2 are but two of them. In Fig. 1 we have three segments, as indicated by

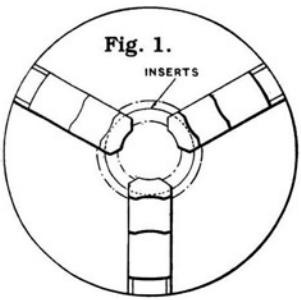
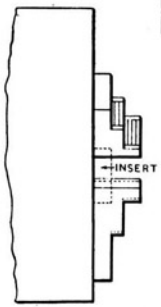


Fig. 1.



chain lines, upon which the jaws are closed in tightly, leaving the inner gripping surface ready for grinding without any interference.

In Fig. 2 we have the jaws drilled at

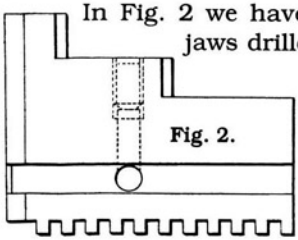
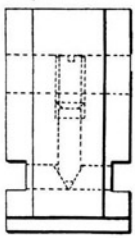


Fig. 2.



right angles to the register as shown. Into this hole, and central with it in each direction, is drilled a 1-inch diameter hole down from the face of the jaw. The upper part of this hole is then tapped out 5/16-inch Whitworth. Plugs are inserted as shown. When at work it is only necessary to tighten the set-screw, give the scroll a turn to take up all the back lash, and proceed with the grinding.

In the small shops, where the luxury of the grinder is unknown, lapping or turning may be resorted to. If lapping is attempted, the writer would recommend the method of holding the jaws in position, described in Fig. 2, and a lap of the sleeve type sliding on a parallel bar, held between the centres. By far the better way would be to turn the jaws. If they were softened overnight, very little time would be lost. Either method of holding them while turning might be employed.

In passing over this subject, the writer cannot help expressing surprise at the frequency with which the method shown in Fig. 3 is employed by men who claim to hold first rank amongst turners. This method is obviously wrong, because the strain on the jaw is reversed, and any inequalities of the teeth will be reproduced on the work when held in the chuck.

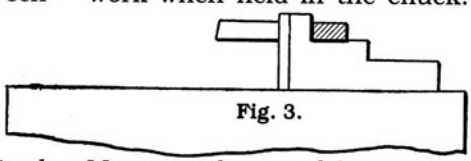


Fig. 3.

Moreover, the use of this method has a tendency to produce a bell-mouthed chuck, which is very undesirable. This again is the condition which would be likely to result from the use of the lap described by R.G.E. as the jaws, being generally worn more at the mouth, would tend to take the line of least resistance. T.A.

Drill Chucks

Principles Governing Design and Methods of Operation

BY J. H. – MACHINERY MAGAZINE – JUNE 7, 1917

The scope and functions of a drill chuck are simple in comparison with those of an ordinary lathe chuck. In a drill chuck, a cylindrical shank, plain or grooved, has to be held in alignment and with sufficient firmness to resist slipping under the stress of work. But around this simple requirement a large number of mechanisms have been constructed, and the design is still in the course of evolution, tending to simplification rather than elaboration, as is the case in many kinds of appliances.

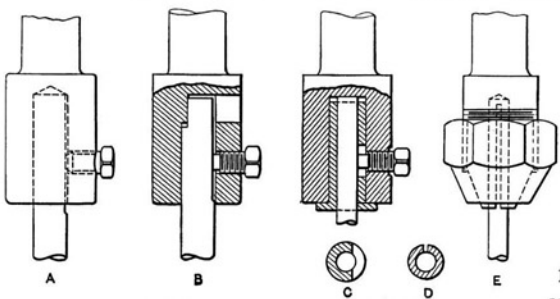


Fig. 1. Simple Types of Drill Chucks

Methods of preventing slippage, which wastes time and damages shanks, must not interfere with the loosening of the tool. A chuck, therefore, should be constructed so that hard gripping of the drill will not result in jamming. Although many chucks are self-tightening and hold more firmly as the drill tends to slip, they are not necessarily difficult to unlock. Hardening of the working parts makes unlocking easier, for unhardened steel surfaces are compressed out of shape or torn, with consequent seizing of mating parts. Slippage is not so trifling a matter as it may appear, es-

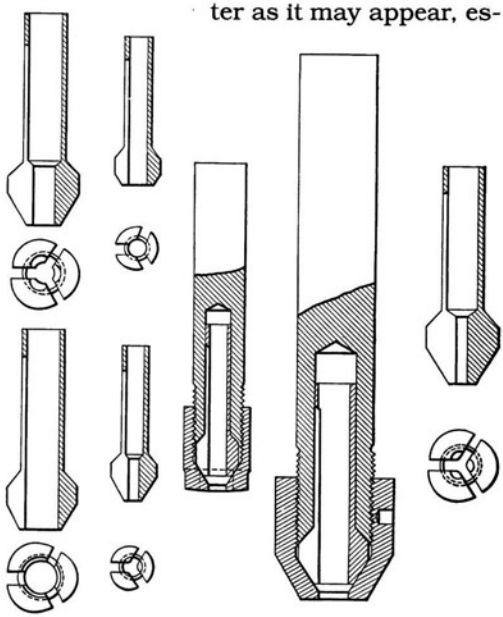


Fig. 2. Collect Chucks for Small Drills

pecially with regard to its effect on the shanks. Their tearing up and consequent deformation soon affects the truth of running and although this is not such a vital matter in plain drilling, it is of great importance in the case of drills and tools used with jigs, and in operating counterboring, facing and other tools which are supposed to run true when secured in a chuck. Their irregular running may not at first affect results, but side pressure will eventually wear the pilots and produce accentuated errors. The same thing happens with ordinary drills of twist or straight flute form; if running eccentrically, they wear on one side and true drilling becomes impossible. Any chuck that grips a shank rigidly should run it truly, so recent practice favours the principle of a floating hold, by which all difficulties of this kind are eliminated, and lack of accuracy in the chuck mounting or spindle running has no effect on the working. The shank is fitted loosely, although driven in a positive manner, and the point of the tool is at liberty to wobble. It ceases to do so as soon as drilling commences, and the freedom to follow a true rectilinear path produces better work. Also, the drills are not so likely to wear,

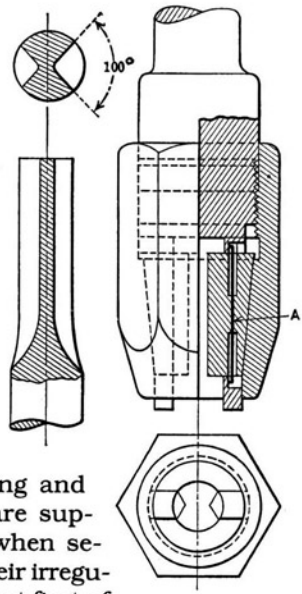


Fig. 3. Drill Chuck for Graham Grooved Shank

heat or break. The floating drive is of particular value in such operations as reaming, counterboring and countersinking, tapping, etc., and in connection with jigs, especially those employing short, stiff shanks.

The necessity for frequent changes of tools, brought about by the quantity of repetition work now done and by the fact that jigs are so extensively used, has made it necessary to discard some of the older chucks, because they are slow in loosening and tightening. While very good for holding shanks during a considerable period, they are too wasteful of time in handling the class of work just specified. If they are employed, the time consumed in substituting tools is so long in comparison to the running time that the benefits conferred by the use of specialized outfits and jigs are largely lost. The time lost is not only that spent in unlocking the chuck, but also that required to stop the rotation of the spindle and to start it again. In some classes of work it is necessary to use a dozen or more different tools in quick succession. For this reason, a chuck that can be

released and regripped while the spindle is running at full speed would mean an immense increase in the output, and the trend of the latest designs is toward the attainment of this end. The cost of the tools is lessened by using collets or bushings, so as to adapt various sizes of shanks to one chuck.

The application of a chuck to a drilling-machine spindle is an alternative to holding shanks direct in the spindle aperture, and is really only a convenience to enable various tools to be substituted quickly. When the spindle only is used, the hole has either parallel or tapering sides, the latter being preferred. Many machines, particularly the lighter classes used by blacksmiths and small shops, have standard size holes with parallel sides in which the shanks are secured by set-screws of the plain or socket style. Drills with uniform shanks to fit these machines are furnished by the makers, and by using sockets, drills with smaller or larger shanks may be driven. This practice is suitable for the class of users concerned, but it does not meet regular workshop conditions so well. Truth of running is likely to become affected in time, the expense of drills with the uniform diameter shanks, especially the smaller sizes, becomes quite heavy, and there is no proper means of holding special drills or tools. Hence, a chuck with movable jaws that will grip any tool soon repays its cost.

When standard tapered holes are used in the spindles, the tools do not work out of truth, as in the case of a hole with parallel sides, and the set-screw, which is a clumsy device, is abolished. Its place is taken by the tang, which affords a positive drive when such is necessary. Besides, various sizes of shanks may be used by the employment of sockets and sleeves. This device does not provide a rapid means of changing drills, and is chiefly useful for medium and large size machines. In the small machines, the tapered hole is retained, and used as a medium for the fitting of a chuck; the latter has its body prolonged into a taper shank or has a shank fitted in a hole.

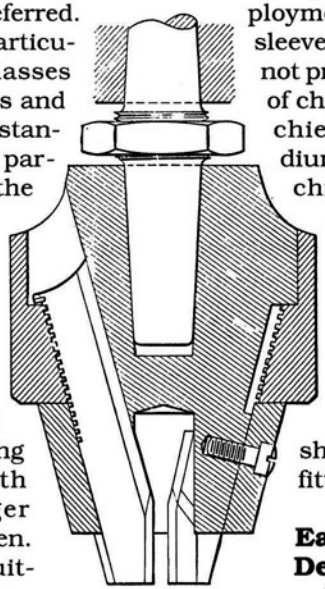


Fig. 4. Three-jaw Scroll Chuck operated by Knurled Sleeve.

Early Chuck Designs

The earliest designs of chucks in which the shanks were held with a set-screw are still used in the rougher. kinds of machines. The shank shown at *A*, Fig.

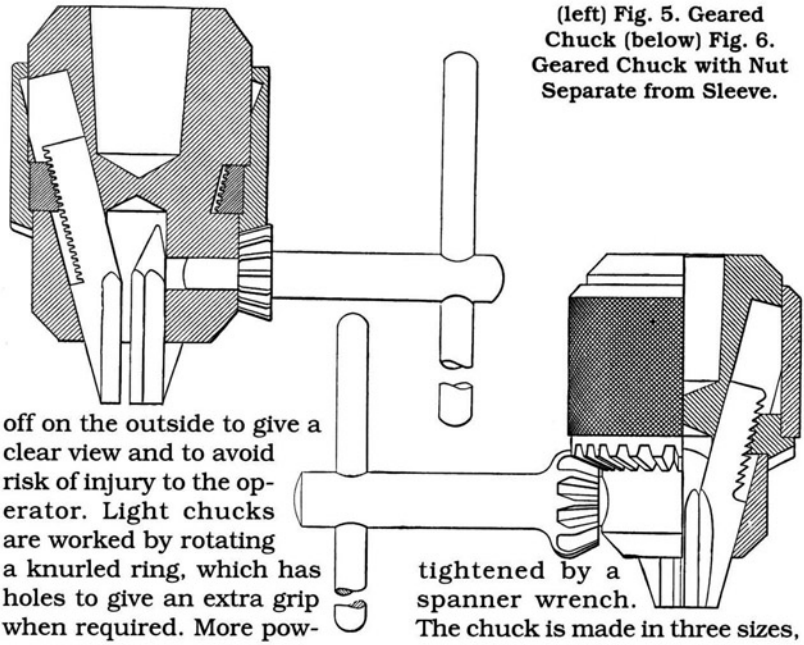
1, has a flat on which the set-screw bears and acts as a driver. The method of making a flat on the tail of the shank to catch against a flat in the chuck was soon developed, so that a positive drive independent of the set-screw resulted. At *B* is shown an example of this design. The set-screw is needed only to keep the drill from falling out of the chuck.

A collet or bushing may be fastened in place by letting the screw press on the shank, through a slot cut in the bushing, as at *C*, or by splitting through at one side, as at *D*. The latter device preserves the shank from the marring action of the screw tip. A nearer method is to close the bushing by cone pressure, as in collet chucks. For single sizes, the chuck body can be split, threaded and coned so that the tightening of the nut binds the shank; this form is shown at *E*. Interchangeable collets should be formed with long stems, as illustrated in Fig. 2, which shows several sizes made by the Trump Bros. Machine Co.; these will hold drills ranging from 0 to 3/8 inch in diameter. The chuck shank is either held in a larger chuck or is turned on a taper to fit a spindle. The ultilization of collets or liners to adapt one chuck for different diameters of shanks is not so common as formerly, because the same effect can be attained more simply and with less trouble by an adjustable jaw chuck. The liners are a source of trouble on account of dirt and must be wiped before they are placed in position; in addition, they wear in course of time, so that the shank is pushed to one side and runs eccentrically.

In the chuck made by the National Twist Drill & Tool Co. of Detroit, U.S.A., a coned nut is used to close in the sleeve fitting inside the body. There is a tang on the tail of the sleeve to engage with a slot in the body, giving a positive drive, and the sleeve is shaped internally to a Morse taper, or it has parallel sides and prongs to catch and drive a Graham grooved shank. Another design of chuck intended for these shanks is manufactured by the Cleveland Twist Drill Co., and is shown in Fig. 3. The jaws that clamp the Vgrooves are fitted into slots in the chuck body and are forced inward by the turning of the nut, which has parallel bearings at the front and rear to preserve alignment. A flat spring A presses the jaw outward to release the shank when the nut is slacked off.

Scroll and Geared Chucks

The introduction of regular jaws enables a chuck to hold a certain range of diameters; the methods of actuating the jaws are varied. One of the earliest ideas was to follow the scroll design, and some chucks are still made on this principle, particularly those intended for use in the lathe to hold rods as well as drills. The mechanism is similar to that of an ordinary scroll chuck, the jaws being bevelled

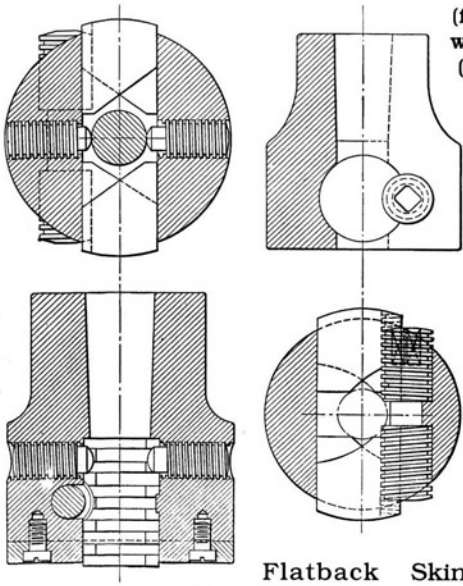


(left) Fig. 5. Geared Chuck (below) Fig. 6. Geared Chuck with Nut Separate from Sleeve.

off on the outside to give a clear view and to avoid risk of injury to the operator. Light chucks are worked by rotating a knurled ring, which has holes to give an extra grip when required. More powerful designs embody a gear scroll mechanism, with bevel or worm-gears turned by a key.

A more convenient adaptation of the scroll principle is that of cutting the scroll inside a coned ring and guiding the jaws in grooves at the same angle. This arrangement results in a more compact form of body, and since the jaws do not travel radially, as in the flat scroll device just mentioned, the nose formation of the chuck can be made more pointed; this is a handy feature in the case of small drills and fine work. The threads of the scroll are often square; but a buttress section is preferred by some as being better adapted to resist the direction of pressure. Fig. 4 shows the Skinner chuck, with square threads cut inside the knurled sleeve, which can be tightened by a spanner wrench. The chuck is made in three sizes, 0 to 7/32 inch, 0 to 11/32 inch, and 0 to 17/32 inch.

The geared chucks afford a more convenient method of operation than rotating a knurled sleeve, because the latter requires the spindle to be held from turning, thus necessitating the use of both hands. By turning the sleeve with a gear and key the necessary twisting action is transferred to a different direction and has no rotative influence upon the spindle. Extra power is also obtained, a more essential feature nowadays than some time ago, when high-speed steel was not in general use. The chuck which is made by the Jacobs Mfg. Co. of Hartford. U.S.A., shown in Fig. 5, has a bevel pinion formed on the key; this rotates the sleeve and turns the nut, which is made in halves.



(far left) Fig. 7. Westcott Chuck with Side Screws for Extra Grip
(left) Fig. 8. Screw Chuck with Cylindrical Jaws

Flatback models are built without the chamfer at the back of the body, so that the chuck is shortened and lightened and is more suited for use on pneumatic electric or flexible drill shafts and for other work where the minimum of weight and size is desirable. Especially light chucks are also constructed by turning a large groove around the body and making some other parts thinner.

The Almond geared chuck is made somewhat like the chucks that are not geared but are rotated by a knurled sleeve. The teeth are cut direct upon the nut, as in Fig. 6, which is hardened and split in halves. The sleeve only serves as a means of rotating with the fingers and to cover the jaw apertures, and need only be forced on the nut with moderate pressure, as none of the strain of turning with the key comes upon it. The holes in the body that receive the key seem are provided with hardened bushings to give longer life and maintain alignment of the pinion. In the largest chuck of this series, a capacity from 3/8 to 1 inch diameter is afforded.

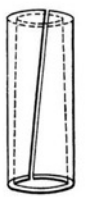
In one or two instances the practice of having the ring of teeth inside has been adopted—as in the Skinner geared chucks—which have pinions laid in pockets. These are covered by the sleeve, except for an opening through which the key is passed to enter into the squared hole in the pinion. The external position is preferred, however, by many, as they claim that this permits a larger pinion and stronger teeth to be utilized.

Two-Jaw Chucks

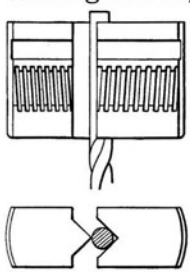
A popular style of chuck is the two-jaw type actuated by a right- and left-hand square thread screw. The jaws are notched out to interlock and grip from 0 up to the maximum capacity. The consequent breaking up of the surfaces into a number of separate "bites" assists in obtaining a firm grip for heavy work, a point of importance in high-speed drilling with hard feeding or gripping bars for deep turning or threading cuts. Auxiliary

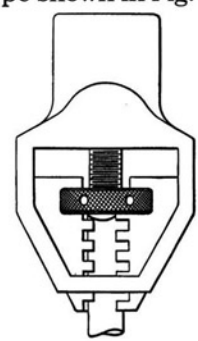
means are taken to strengthen the grip in some designs, such as by the use of side setting-up screws, as in the Westcott device shown in Fig. 7. After the drill has been centred by the jaws and they have been tightened, the side screws are set up, preferably on slight flats made on the shank. Another device is that of a forged steel cap attached to the chuck face with screws that permit a floating movement. A screw in the edge of the cap can be set up to bind the backs of the jaws together and so draw the gripping surfaces more tightly on to the shank. Yet another method is to provide a sort of draw-bolt through the jaws on the opposite side to the right- and left-hand operating screws, the bolt serving to prevent the spreading tendency of the jaws.

The Horton screw chucks are constructed with cylindrical jaws fitting Closely in a reamed hole in the body a neat and compact mode of fit – as shown in Fig. 8. For a positive drive some of these chucks have a pair of flat ended set-screws tapped through on opposite sides of the body, behind the jaws, the screws being adjusted to engage with the squared end of a tap, drill or other tool. A special type is also built for holding either straight or tapered shanks by means of a duplicate set of jaws at the rear, which are set in accordingly. For a tanged taper shank, the rear set of jaws can be set to give a positive drive to the tang.



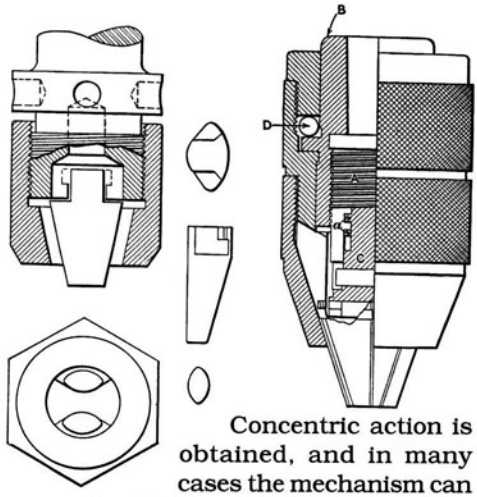
Several makes of screw chucks have provision for positive driving through a slotted plate or extra jaws at the top of the regular jaws. Thus a tanged or a squared drill or tap may be positively rotated without any need for tightening the jaws up hard. In the Pratt design the jaw slot is carried up sufficiently to receive a driver plate, Fig. 9, which has a slight amount of play for centring. When the fitted tang is passed up into the slot in the plate the latter catches against the sides of the chuck slot and acts like a lathe dog. Taper-shank drills require an adapter sleeve such as that shown in Fig. 9. In other chucks a pair of plates are attached, either on opposite sides of the bottom of the slot where the jaws stop or or the tops of the jaws. A similar device is sometimes adopted in the three-jaw chucks of the general type shown in Fig.





(left) Fig. 9. Driver Plate and Taper Sleeve (middle) Fig. 10. Reid Chuck Jaws with Three Contact Points (right) Fig. 11. Open Type of Chuck with Positive Drive

(right) Fig. 12. Chuck for Grooved Shank (far right) Fig. 13. Horton-Morrow Drill Chuck with Ball Bearing



4, a transverse slot being formed in the body at the back of the jaws. One exception to the usual practice of notching out jaws to interlock is found in the Reid screw chuck, Fig. 10. This arrangement holds from 0 to maximum with three contact points.

Jaws closed by one Cap

A number of chucks incorporate the principle of three (sometimes two) jaws loose or pivoted, closed in by a coned cap which is moved longitudinally. Concentric action is obtained, and in many cases the mechanism can be made self-tightening. The chucks used on hand braces are simple examples of the type, consisting of a knurled sleeve pressing on the bevelled noses of a pair of jaws. The ends of the latter rest against a V-shaped base, so that the closing in causes them to slide inward and so bear on their whole-length on the shank, whether straight or tapered. In some instances, though the cap is used, it does not slide, but the jaws are pushed along by a tail plate, and the coercion of the coned cap produces the closing action.

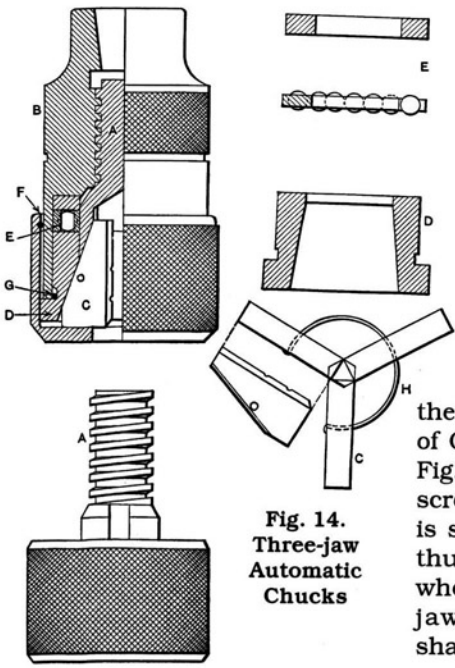
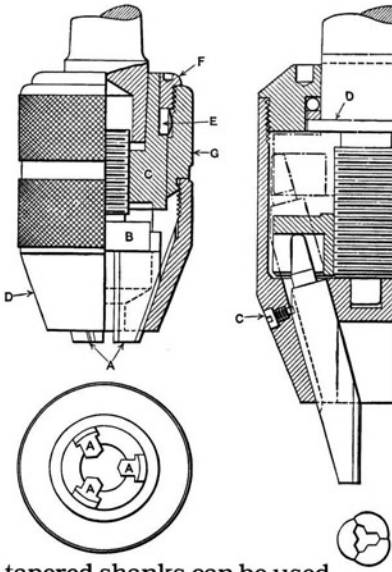


Fig. 14. Three-jaw Automatic Chucks

In another design, made by the Oneida National Chuck Co. of Oneida, U.S.A., and show in Fig. 11, the knurled head of a screw moves the jaws. The head is slotted out to take the tang, thus affording a positive drive when desired. The interlocked jaws shown are for parallel shanks, but a pair for holding



(far left) Fig. 15. Roller-bearing Chuck. (left) Fig. 16. Coit Ball Bearing Chuck

tapered shanks can be used. In the latter the inclination of the "bites" from front to back is made to suit any particular Morse taper desired. The positive drive by a tang fitting in the screw head is used also in this case. A more recent design is also made of this chuck with a ball bearing to take the thrust, and the tightening or loosening is effected by a large knurled part of the body behind the jaws. The jaws automatically tighten according to the pressure being exerted on the drill.

The chuck manufactured by the Rich Tool Co. of Chicago, Fig. 12, has jaws closed in by turning the nut, which is coned to match the backs of the jaws, and their tails are shaped to fit in a groove in the body and prevent misplacement. The Rich drills and reamers with grooved shanks are held in this style of chuck and the jaws clamp an inward taper of the groove in the shank, which prevents the tool pulling out, so that a moderate amount of tightening of the nut suffices.

Chucks with Anti-Friction Bearings

The action of a screw in tightening a coned cap around the jaws of a chuck is objectionable on account of the jamming that occurs, making release difficult. But this objection is easily overcome by introducing an anti-friction bearing consisting of a ring of balls or rollers which do not bind like plain surfaces. There are a good many makes of chucks working on this principle. In the Horton-Morrow chuck, made by the E. Horton & Son Co., of Windsor Locks, U.S.A., and shown in Fig. 13, the tightening is effected by a large fine-pitch left-hand screw *A*, which automatically tightens in the head *B*, as the drilling pressure increases. The jaws are carried in slots in a releaser *C* driven by a couple of pins engaging in slots in the end of the fine screw *A*. A small amount of play is allowed between the pins and slots so that the releaser possesses a little freedom. The slight rotation of the releaser caused by the opening action brings its coarse-pitch threads a into action, and an instant and easy release is ob-

tained. The ball race is shown at *D*.

In the chuck made by Louis Wearden & Guylee, Ltd., of Bradford, Yorkshire, Fig. 14, only one screw *A* is used. This has a stout square thread and is formed integrally with the coveting cap at the base. The act of screwing *A* into the body *B* raises the jaws *C* and makes them close in by reason of their coned backs pressing against the coned ring *D*. The thrust is received on the race *E* and the hardened washer above it, which prevents the screw from binding. Spring wires *F* and *G* lock the screw *A* and coned ring *D*, while another wire *H* gives the jaws a tendency to spring outward. To release the drill while the chuck is running, the knurled surface of screw *A* is struck sharply with the hand, delivering the blow in the direction of rotation.

An example of a roller-bearing chuck is shown in Fig. 15; this bearing has the advantage of large diameter balls and requires less space. The jaws A are propelled by a slotted head *B* into which they are tongued.. The head is integral with a coarse-pitch double-thread screw running through the head *C*, and its movement outward or inward contracts or expands the jaws within the hood *D*. The rollers *E* take the thrust between the head *C* and the ring *F* screwed into the body *G*. This chuck is made by the Eclipse Machine Co. of Elmira, U.S.A.

The Coit chuck, Fig. 16, made by the Narragansett Machine Co., Providence, U.S.A., has three jaws propelled by a slotted nut *A*, which runs up and down the screw on the shank *B* according to the way the knurled shell is turned or held by the. hand clasp. The jaws which have disc-shaped tails to catch in the slots in nut *A*, are kept straight by a screw *C* entering a slot in each. Pressure comes against the large flange *D* on the shank, and this is transmitted to the ring of balls above. The chuck automatically tightens as the drilling stress becomes greater.

Self-Tightening Chucks

The chucks of another group are built on the self-tightening principle of an eccentric action, which causes the jaws to roll or flit, and in doing so to bring their surfaces more to the central axis. An attempt of the drill to slip produces extra tightening. Three designs are noticeable, one with round rollers, one with eccentric rollers, and one with lever-like pivoted jaws. In the type with round rollers, of which the Gronkvist, Fig. 17, is an example, the gripping results from the climbing of the rollers up the faces of the three-lobed internal cam. The clutch movement increases with and increase of drilling stress. Normally, the chuck is held closed by a coiled spring and the operator turns the outer knurled sleeve against the direction of rotation of the spindle to open the jaws for the insertion of a drill. After this has been done, he releases the sleeve, and the jaws automati-

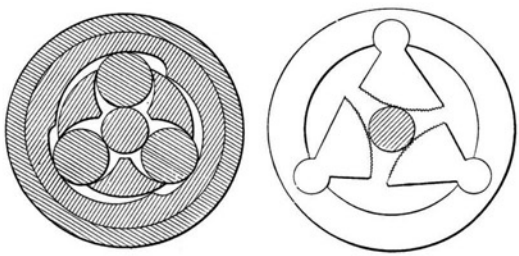
cally grip the shank. As the rollers are quite smooth and hardened, they do not inflict.any injury on the shanks.

The Wahlstrom Tool Co.'s chuck, Fig. 19, represents the eccentric roller device, the jaws being so shaped, as shown in the plan, as to roll up the cam faces inside the shell. The spring A keeps the shell turned so that the jaws are normally closed. If gripped momentarily by the hand while running, its rotation is stopped and its relation to the body altered so that the jaws open. After the insertion of the drill, the resistance developed makes the jaws roll up the cam faces.

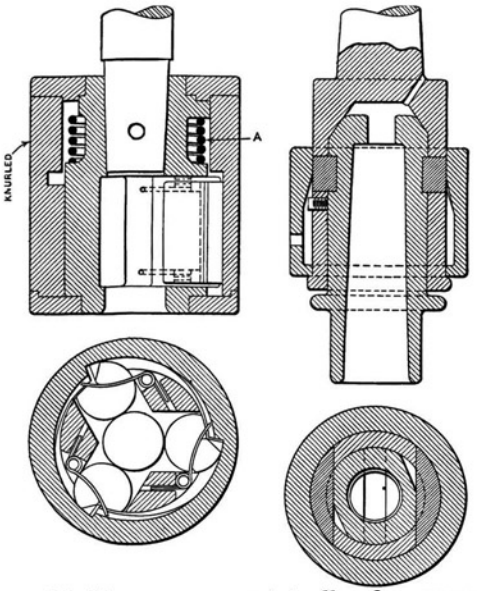
In some chucks eccentric roll jaws are turned positively by teeth inside the shell, each jaw having a couple of teeth meshing with these. A clock spring normally keeps the chuck closed. The arrangement of the jaws is shown in Fig. 18. The principle on which these lever-like pivoted jaws are based is the same as that of certain safety catches for lifts and other mechanisms. The biting of the jaws into the moving element the drill forces them to move radially and increases their grip, so by disposing the three (or sometimes four) jaws equally around the circle a concentric grip is obtained. As usual, a spring is fitted to close the jaws until the operator separates them by arresting the rotation of the knurled sleeve.

Pocket Style of Chucks

During the last three or four years there has been developed what might perhaps be most suitably termed the "pocket" style chuck, because it embodies the principle of a roller, ball, or pad dropping into a pocket and affording a drive to the tool or to its collet. The objection to these chucks is that, as there are no regular jaws to grip various diameters, it is necessary to make the tool shanks to a special formation, or (as must often be done) to employ special collets. These chucks are of the greatest advantage in repetition and jig work, where a set of tools must be utilized in the same spindle in rapid sequence. As a floating drive is given its degree depending on the fit of the shank in the chuck, considerable advantage is gained in jig work, where a rigidly constrained tool is frequently undesirable on account of the tendency to. wear the bushings. Even in ordinary drilling, the floating drive is advantageous, because the drill is



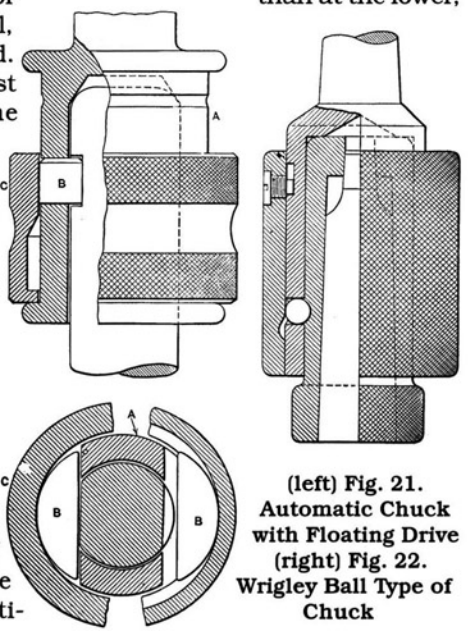
(left) Fig. 17. Principle of Cam and Roller Action in Gronkvist Chuck (right) Fig. 18. Principle of Pivoted Cam Jaw Action



(far left) Fig. 19. Eccentric-jaw Automatic Chuck
(right) Fig. 20. Pad Type of Quick change Chuck

enabled to run concentrically after commencing the hole, and no lateral spring arising from a slightly untrue drill or other cause will occur. Examples of each design, the pad, the ball, and the roller, are illustrated. The pad should offer the most powerful drive, but as the pressure is positive, there is apparently not much to choose between its flat line of contact and that of a ball touching at a spot on the diameter.

The chuck made for some years by John W. Barnes of Rock Ferry, Cheshire, is employed very largely, and is made either separately in the usual manner or integral with the end of a drilling-machine spindle. The tops of the tools or their collets are dome-shaped and automatically centre themselves in the bevelled top inside the body *A*, Fig. 21, and their bodies fit freely in the aperture, thus giving the float. The driving pads *B* fit loosely for the same purpose, and the curve of their backs is not the same as that of the inside of the sleeve *C*. In the plan, the left-hand pad is shown engaged, while the right-hand one is free. What causes them both to hold or release simultaneously is the difference in the diameter inside the sleeve. In the upper part it is less than at the lower,



(left) Fig. 21. Automatic Chuck with Floating Drive
(right) Fig. 22. Wrigley Ball Type of Chuck

so that when pulled down to the position shown in the elevation the pads are forced inward and bear on the flats on the shank or the collet. When the sleeve is raised (while the spindle is running), the chambered part of the sleeve comes opposite the pads, and they are thrown into it by centrifugal force, leaving the drill free to be caught by the hand.

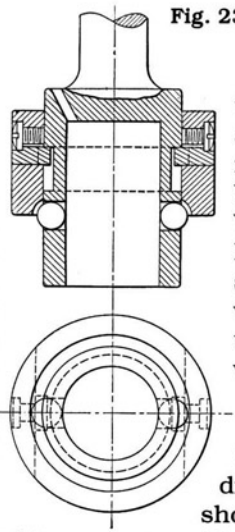


Fig. 23 Modern Tool Co.'s Quick change Ball Chuck

Fig. 20 shows a pad type of chuck, made by Vickers, Ltd., London, S.W, in which release is also effected by raising the sleeve. This shows a collet in place, with a taper hole and slot at the top for the drill tang.

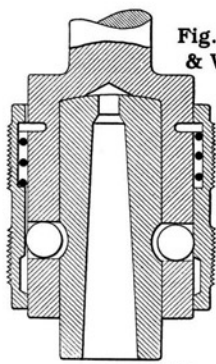


Fig. 24 Morton & Weaver Ball Type of Chuck

Examples of ball chucks are shown in Figs. 22 to 25, the first being that made by E.G. Wrigley & Co., Ltd., of Soho, Birmingham. In this the balls abut against a collet having flats at 180 degrees, and transmit the drive through it. The sleeve is shown down in the driving position, keeping the balls pressed into action. When it is raised to a height limited by the setscrew in the groove, the weight of the collet and tool forces the balls outward into the pocket.

On the reverse action, the balls are pressed inward and engage and drive the collet. The chuck shown in Fig. 24, manufactured by Morton & Weaver, Coventry, also uses two balls. In this case a coiled spring presses the sleeve down and maintains the balls in the driving position, so that the chuck can be used horizontally or upside down. The Modern Tool Co. of Erie, U.S.A., manufactures the ball chuck shown in Fig. 23, in which springs are omitted. The force of gravity draws the locking sleeve down and thus pushes the balls against the grooves in the collet. The positive drive in these chucks is disadvantageous for the operations of at tapping and studding, and the firm supplies a special friction drive for use in such cases. Two fibre discs transmit

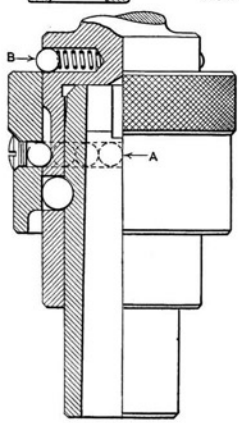


Fig. 25. Quick-change Chuck with Ball Race

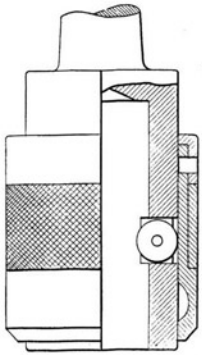


Fig. 26. Quick-change Chuck with Roller Drive

the drive, and the pressure between their faces may be regulated by a nut. A stud-holder is also furnished to use in conjunction with the friction drive.

The addition of a ball race to take the running wear and to render the sliding of the sleeve easier is illustrated in Fig. 25. This chuck is manufactured by Alfred Herbert, Ltd., of Coventry. The balls *A* bear upon the grooved body. The ball and spring *B* lock the sleeve as shown, so that the chuck can be used in a horizontal or an inclined position, as well as in the usual manner. The collets are slotted through at the top, so that they will drive a tang, and access can be had to the end of the latter for the purpose of driving it out

An example of a disc used for driving is shown in Fig. 26 (made by the Wiard Manufacturing Co., Detroit, U.S.A.) These discs act in a similar manner to the balls in the preceding example, and fall into pockets in the sleeve.

Regrinding Chuck Jaws

Letters on Practical Subjects

MACHINERY MAGAZINE – JULY 5, 1917

The truing of lathe chuck jaws, which are usually hardened and therefore require grinding, is an operation that must be performed frequently, especially when the chucks are used on accurate work. Some of the errors usually made when doing this work can be easily avoided by a little care. When new, the jaw is a free sliding fit in the body of the chuck; and if worn much, from constant use, it sometimes becomes very loose. For this reason, if the stress on the jaws is similar to that indicated in Fig. 1, they assume a shape like that shown (exaggerated) in Fig. 3; if the stress is like that indicated in Fig. 2, the result is as shown in Fig. 4.

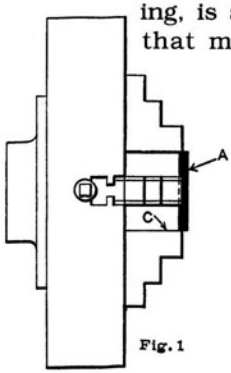


Fig. 1

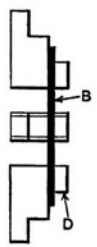


Fig. 2

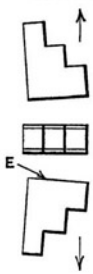


Fig. 3

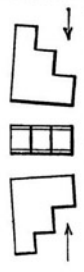


Fig. 4

If surface *C* is to be trued,

the usual way is to chuck a ring by the inside as shown at *B*. The stress on the jaws is then as indicated by the arrows in Fig. *A*, and all the pressure will be at point *E*, and not distributed along the length of jaw as it should be. A better method is to chuck a smaller ring, as shown at *A*, and grind up as close to it as conditions will permit. Afterwards the jaws may be taken out of the body and the small surface covered by ring *A* ground, either by the use of a small cutter grinder or free hand, the previously ground surface being used as a guide. In the same way, if it is required to true up the steps *D* for inside chucking, the stress on the jaws, while it is being done, should be as indicated in Fig. 4, or similar to that existing when the chuck is actually in use. The ring *B* used for this purpose can be made very thin, so that the surface covered by it will be small and easily removed later.

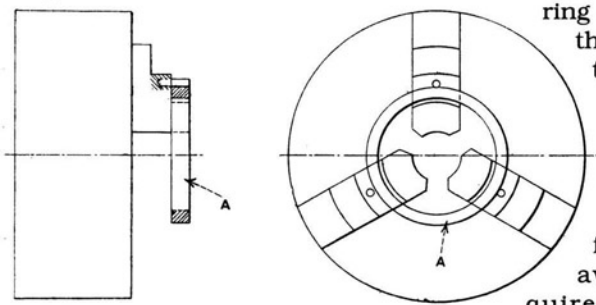
A.D.

Truing Chuck Jaws

Letters on Practical Matters

MACHINERY MAGAZINE – NOVEMBER 8, 1917

On page 381, Vol. X., methods of supporting chuck jaws during the truing process are shown. The accompanying sketch illustrates a method we adopted which has, we think



advantages over that described by A.D. A small hole (about 3/16 inch) is drilled as shown in each jaw and steel pins driven lightly in which grip suitable rings A. The pressure not being at the extreme front of the jaws is an advantage; also, there is no surface taken up by the ring to remove after. Again, the jaws can be corrected as often as required by re-inserting the pins and either reducing the diameter of the ring slightly or filing three small flats on to give the necessary grinding allowance. The holes are easily drilled if the hardened surface is ground away at the required spot, but if much carving is to be done at the jaws it pays to soften them, turn them out to shape, reharden, and finally grind to finished sizes. In this case the holes would, of course, be drilled while they were soft.

Y.A.D.

Repairing Chucks

Letters on Practical Subjects

MACHINERY MAGAZINE – NOVEMBER 22, 1917

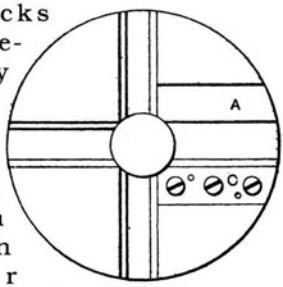


FIG. 1

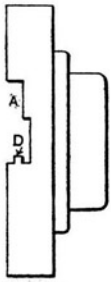


FIG. 2

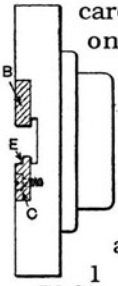


FIG. 3

Chucks are frequently scrapped owing to the jaws having worn loose on their slides, so much so that they will only grip at the end near the face instead of the whole of their length, or through continual use these slides *D*, Fig. 2, are actually broken away from the body of the chuck. The accompanying illustrations show a very simple method of making a most satisfactory repair of a chuck, otherwise sound except for the defect mentioned. The jaws are removed and the chuck carefully set up on a milling machine, and the slide to be renewed is cut away, as shown at *A* in Figs. 1 and 2. A piece of mild steel *B*, Fig. 3, is carefully and securely fitted by cheese-headed screws and a couple of steady pins to make the job absolutely rigid. The step *E*, Fig. 3, is now milled identical to the existing ones, and the repair is complete as indicated at *C*, Figs. 1 and 3. This is a most effective repair, and I have seen it used with equal success on large and small chucks.

R. R. HUTCHINGS